Philips CMS Patient Monitoring System

Service Guide

PHILIPS

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Overview

Introduction

The Philips CMS Patient Monitoring System Service Guide is a reference guide featuring six chapters on how to test, troubleshoot, and repair the instrument.

The Philips CMS Patient Monitoring System and the Philips Anesthesia CMS Patient Monitoring System, as well as the Philips Neonatal CMS Patient Monitoring System will be referred to throughout this guide as the CMS.

Target Audience

This reference guide is intended for hospital Biomedical Engineers and Technicians, Philips Customer Engineers, Response Center Engineers, and Installation Planning Specialists who have experience servicing Philips patient monitoring devices or similar products.

Prerequisites

In addition to this guide we recommend you to complete the Philips *Patient Monitors – Concepts Guide* also contained in the Service Training Kit.

Course Objectives

This guides objectives are:

- Identify the major units of CMS.
- Identify the controls and connectors of the major units of CMS.
- Identify the four operating modes of CMS.
- Connect the cabling of the CMS.
- Complete a Quick Check of the system.
- Perform Safety checks.
- Perform recommended maintenance.
- Perform a general inspection of the system.
- Clean the major units of the CMS.
- Perform Self-check procedures for CMS modules.
- Recognize a properly operating CMS.
- Identify symptoms of improper operation for the CMS.
- Use any symptoms or indications to identify a fault as being in the display module, computer module, or the plug-in parameter modules.
- Further isolate faults down to field-replaceable assemblies.
- Locate and understand the removal and replacement procedures for the CMS and ACMS.
- Provide a list of available parts for the CMS and ACMS.

In This Guide

Chapter 1 - Introducing the CMS provides a physical/functional overview of the monitor.

Chapter 2 - Testing & Maintaining the CMS describes how to test, maintain and check that the instrument operates in an optimum condition.

Chapter 3 - Troubleshooting the CMS provides troubleshooting and diagnostic procedures for the monitor.

Chapter 4 - Troubleshooting the Plug-in Modules provides troubleshooting and self-test procedures for the parameter modules.

Chapter 5 - Repairing the CMS includes removal and replacement procedures for field replaceable parts.

Chapter 6 - Parts List for CMS lists replacement and exchange part numbers for the instrument.

Appendix A - Product Information gives a listing of the options for the monitor.

Appendix B - Conversion Charts gives relative conversion information.

Appendix C - Philips 15210B Calibration Unit gives service and installation information for this instrument used in calibrating plug-in modules.

Appendix D - CPC Programming Tool Manual

Glossary gives relevant definitions for the system

Index gives an alphabetical listing the contents of the guide.

How to Use this Guide

Each chapter begins with a title which is followed by three sections: an opening statement, an objectives statement and a concepts listing. These three sections can be thought of as your guide to the chapter. They will tell you what you are going to find in the chapter, what you should take away from the chapter in the way of goals and terms, and concepts central to the chapter.

Chapters containing procedures will then proceed with a procedure overview table and the body of the chapter. The procedure overview table is your guide to the actual procedures in the chapter. It is designed to be used by an experienced user who needs a quick review of the procedure or a page number of a particular procedure.

The body of the chapter will cover all of the procedures associated with the task. In order to make the procedure easier to follow, we have kept the body of the text focused on the procedure at hand and pulled the extra information, which might be helpful to a new engineer, into the outside column. Here is a formatting example:

Example: Inspect the System Hardware

Inspecting the system on an annual basis will help you keep track of your system and identify potential parts that need to be replaced.

No tools are required to perform this inspection.

Step 1 Examine the exterior of the unit for cleanliness and general physical condition. Check that the plastic housings are intact, that all hardware is present and tight, and that there are no signs of spilled liquids or other serious abuse.

Step 2 Check fuse values and type against that marked on the chassis, and ensure that a spare is provided.

Step 3 Inspect connectors of the module rack and ensure that the plug-in modules are locked into place and do not slide out without first releasing the locking plate on the bottom of the module.

Step 4 Ensure all labeling is present and legible.

Step 5 Inspect all accessories external to the system such as transducers, referring to the manufacturer's documentation.

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Chapter 1 Introducing the CMS

This chapter gives a detailed description of the components and operating modes of the CMS, a modular patient monitor with networking and data management capabilities. The system can be upgraded with additional modules as needed, or you can interchange the modules between systems in your units.

This version of the CMS Service Guide introduces the new CMS Release C.0 range of monitors. The new options H03 or H04 (with version M1167A or M1177A) enable the use of an off-the-shelf XGA-compatible display as the main display. The new option H05 (M1167A/77A only) provides a touchscreen XGA display with an External Alarm Device and a RS232 Interface.

There are three versions of CMS corresponding to the three major types of application: CMS (for Critical and Cardiac Care), Anesthesia CMS (ACMS), and Neonatal CMS (NCMS).

The versions and models described by this guide are listed as follows (models indicated by asterisk were discontinued. "(S)" indicates a non-US-model):

CMS: M1165A/66A/67A	Models 54(S)*, 56(S), 64(S), 66(S) and 68(S)
CMS: M1175A/76A/77A	Models 54*, 56, 66 and 68
ACMS: M1165A/66A/67A	Models 74(S)*, 76(S), 84(S), 86(S) and 88(S)
ACMS: M1175A/76A/77A	Models 74*, 76, 86 and 88
NCMS: M1166A/67A	Models 34(S)*, 36(S)*, 44(S), 46(S)* and 48(S)
NCMS: M1176A/77A	Models 34*, 36*, 46* and 48

All of these systems run on fully compatible hardware and are hereafter commonly referred to as the *Monitor or* CMS.

Objectives

In order to meet the chapter's goals, you should be able to:

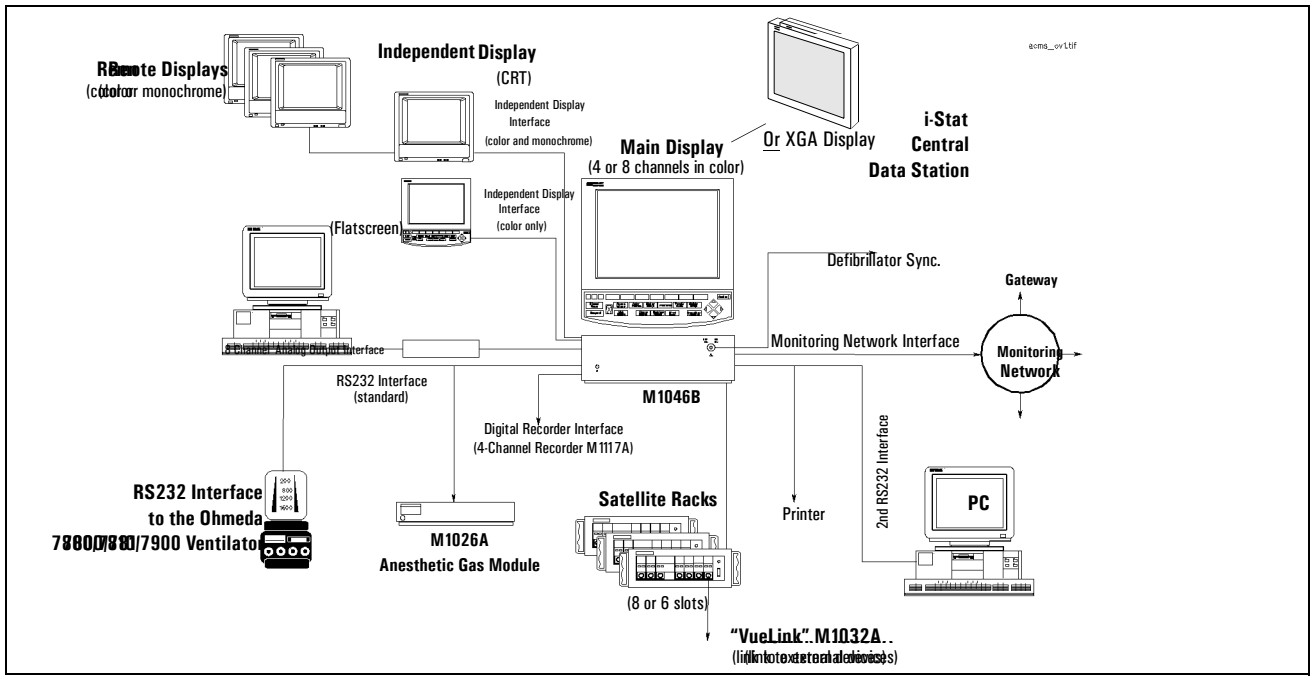
- Identify the major units of CMS.
- Identify the controls and connectors of the major units of CMS.
- Identify the operating modes of CMS.

Concepts

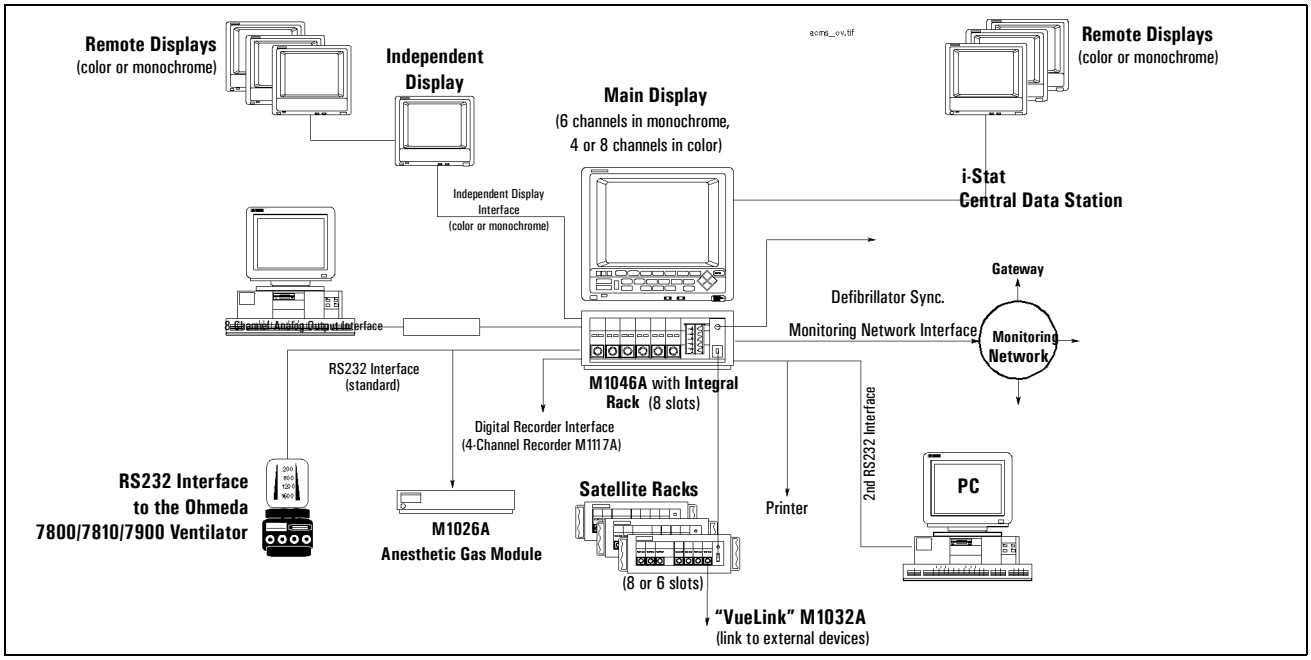
CMS Release C.0 contains the following major units:

- **Main Display Module** - Main Display Modules are 10.4" Flatscreen Color, 14" CRT Color, 14" CRT Mono, or an off-the-shelf XGA-compatible display. The first three have an integrated Control Panel for the human interface; the XGA display option has the External Alarm Device with the Handheld Keypad for the human interface. See page 1-4.
- **Independent Display Module** - Independent Display Modules can be: 10.4" Flatscreen Color; XGA-compatible display; 14" CRT Color or 14" CRT Mono or 21" CRT Color without Control Panels. These displays are connected to the Computer Module by their own display controller and may display different information than the Main Display Module under software control. See page 1-13.
- **Slave Display Module** - Slave Display Modules are 14" CRT Color or 14" CRT Mono or 21" CRT Color without Control Panels. These displays can be daisy-chained to any CRT and display the same information as the display they are connected to. See page 1-13.
- **Handheld Keypad** - The Handheld Keypad is an input device connected to the HIL connector on the Main Display and is used to interact with patient data management and drug calculator software. With the XGA-compatible display options, the **External Alarm Device** complements the Handheld Keypad to give a full set of user controls. See page 1-16.
- **Computer Module** - The Computer Module contains the hardware and software for the processing functions of the monitor. Most of the external connections of the monitor are in the rear of the Computer Module. See page 1-19.
- **Integral Power Supply** - The Integral Power Supply, located in the new Computer Module (M1046B) in CMS products M1167A and M1177A that have the M1095A flatscreen (or an XGA-compatible) as the main display, provides the power for the Flatscreen Display, Computer Module and satellite-mounted Plug-in Modules. See page 1-51.
- **Remote Power Supply** - The Remote Power Supply, used with CMS models that have a flatscreen as the Main Display Module and a M1046A Computer Module, provides the power for the Flatscreen Display Module, Computer Module and Plug-in Modules. See page 1-52.
- **Plug-in Module Rack** (Integral or Satellite) - The Plug-in Module Rack is the interface between the Plug-in Modules and the Computer Module. Plug-in Module Racks can be integrated in the M1046A Computer Module or remotely located in the patient vicinity. See page 1-55.
- **Plug-in Modules** - The Plug-in Modules are the interface between the patient cables and the Plug-in Module Rack. Each Plug-in Module is responsible for specific types of patient measurement (pressure, temp, and so on). These types of measurement are also known as Parameters. The number and type of Plug-in Modules used will depend on the monitoring situation. See page 1-58.

The CMS monitors can be networked on the Philips Network (also known as SDN). If your system is connected to such a network you can receive information from other Philips monitors or send information to the Philips Central Stations.



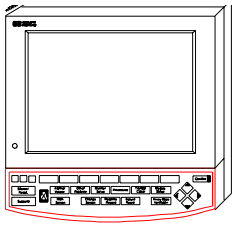
M1167A/77A
CMS (Flatscreen) System Overview



M1165A/66A/75A/76A
CMS (CRT) System Overview

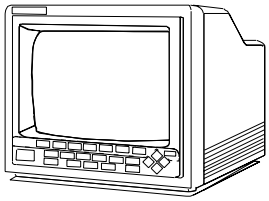
Figure 1-1 Philips CMS Patient Monitoring System

Main Display Module



Flatscreen
Main Display

The Main Display Module of the CMS can be a 10.4" Color flatscreen, a 14" CRT, or an off-the-shelf XGA-compatible display. CRT display-based CMSs can use either a Color CRT Display (M1094B or M1094A) or a Monochrome CRT Display (M1092A) as the Main Display Module. Slave CRT Displays can be daisy-chained from any other CRT displays. Additional independent displays, CRTs and flatscreens can be connected but they need their own display controller in the Computer Module allowing them to show different information than the main display under software control.



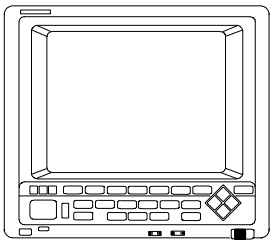
CRT Main Display

The main display (flatscreen or CRT) contains a consistent arrangement of indicators and keys on the Control Panel (human interface). There are two versions of the Control Panel and Handheld Keypad: Standard and Classic. The Classic is no longer available. The Standard Control Panel is available in supported local languages. Slave and independent displays have no Control Panel fitted.

Objective

In order to meet this section's goals, you should be able to:

- Identify the controls and connectors of the Display Module.
- Be familiar with the function of the controls and connectors of the Display Module.



Front Panel of
Display Module

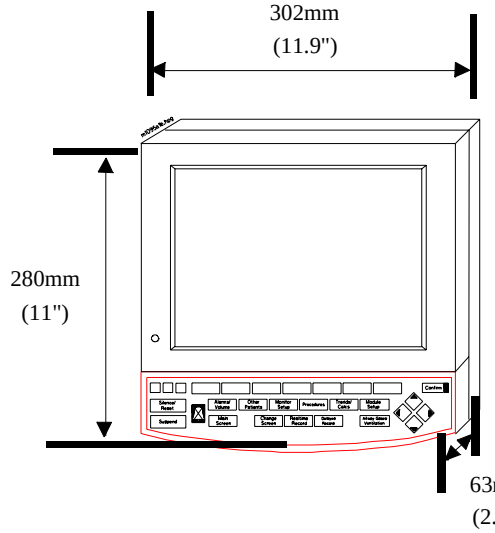
Concepts

With the exception of Options H03/4, the Main Display Module can be either a flatscreen or CRT with a Control Panel on the front panel or bezel. The bezel contains the Control Panel, as well as the main power switch and the adjustments for brightness and contrast. The rear of the display is referred to as the rear panel and contains the rest of the adjustment controls and all of the connectors. The HIL Connector on the CRT Display is on the lower right-hand corner of the front panel.

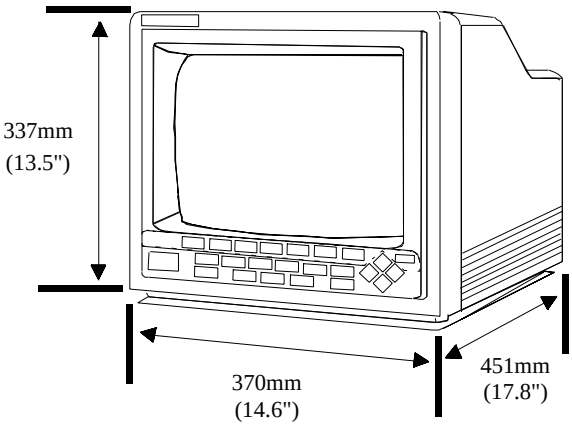
Note: With Options H03/4 the Main Display Module is an XGA-compatible display and the Control Panel is the Handheld Keypad with External Alarm Device.

Front Panel	The plastic bezel on the front of the display that contains controls and connectors, including the Control Panel and display adjustments.
Standard Control Panel	The hardkeys, softkeys and alarm indicators of the Standard human interface (Release E or later). Includes Airway Gas/Ventilation key.
Classic Control Panel	The hardkeys, softkeys and alarm indicators of the Classic human interface. Available with and without the SUSPEND key (see Parts List). Includes HELP key. The Classic Control Panel is not supported from CMS Release B.0.
HIL Connector	The Human Interface Link (HIL) Connector on the Main Display is used to attach the Handheld Keypad and uses Philips HIL protocol to transfer data to the system. The HIL Connector on the CRT Display, which is on the lower right-hand corner of the front panel, can be covered with a plastic insert when not in use.
Softkeys	These are blank single-press keys used as selection controls to enter Task Windows. They correspond to the softkey labels displayed above them on the screen.
Hardkeys	These are single-press keys with labels used as selection controls. Typically, a hardkey accesses the Selection Window of its label.
Rear Panel	The panel on the rear of the display that contains display controls and connectors for power, HIL and video.

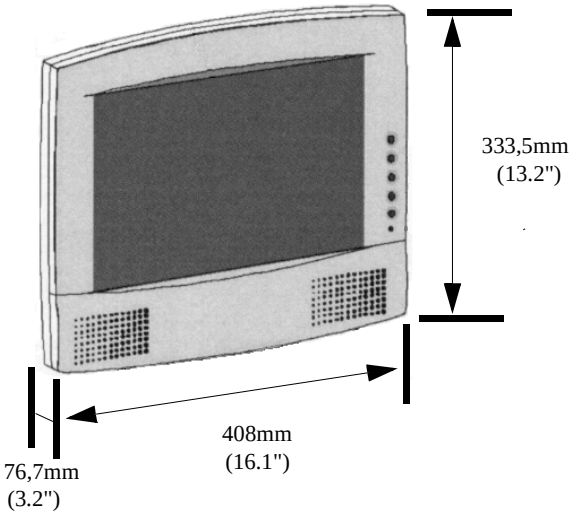
Main Display Module



Flatscreen Main Display Module



CRT Main Display Module



XGA Flatscreen Display Module

Figure 1-2 Display Modules with Dimensions

Front Panel Controls and Connectors – CRT Display

The controls and connectors on the front panel of the Display Module are shown below:

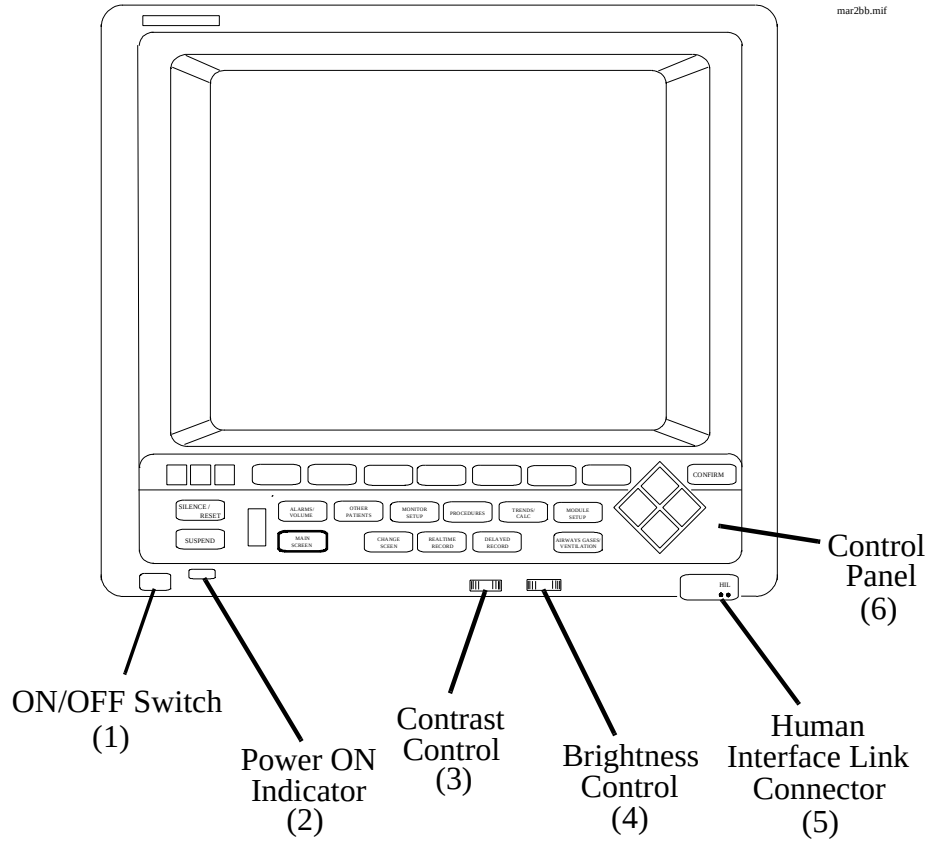


Figure 1-3 The Display Module Front Panel

Table 1-1 Display Module Front Panel Controls and Connectors

	Controls	Function
1	ON/OFF Switch	Used to turn the display On/ Off. This is the only power switch for the system and it must be pushed in for power ON.
2	Power ON indicator	Green LED, which is lit when the display is switched ON.
3	Contrast Control	Rotary control, used to vary the contrast of the display.
4	Brightness Control	Rotary control, used to vary the brightness of the display.

Table 1-1 Display Module Front Panel Controls and Connectors

	Controls	Function
5	HIL Connector	Human Interface Link (HIL) connector is used to connect the Handheld Keypad. This connector may be covered by a plastic insert when not in use.
6	Control Panel	User interface of the Display Module.

Front Panel Controls and Connectors – Flatscreen Display

The controls on the front panel of the Flatscreen Display are shown below:

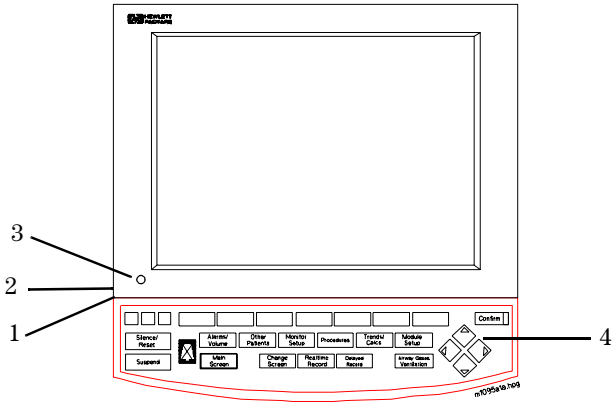


Figure 1-4 The Flatscreen Display Front Panel

Table 1-2 Flatscreen Display Front Panel Controls and Connectors

	Controls	Function
1	ON/OFF Switch	Used to turn the display On/Off and used as the remote switch for either the M1047A Remote Power Supply or the M1046B Computer Module integral power supply.
2	Brightness Control	Rotary control, used to vary the brightness of the display.
3	Power ON indicator	Green LED which is lit when the display is switched ON.
4	Control Panel	User interface of the Display Module.

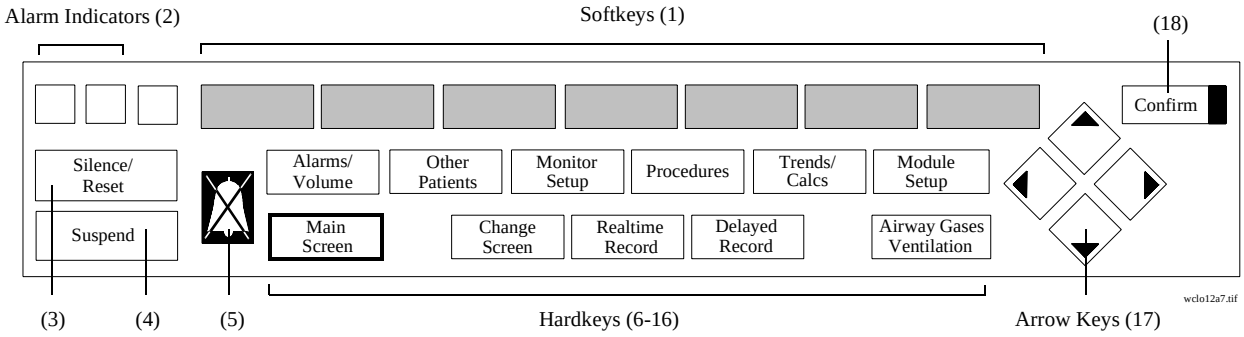


Table 1-3 Standard Control Panel Controls

	Controls	Function
1	Softkey	Selection controls for the softkey labels displayed above them on the screen. Softkeys bring up Task Windows.
2	Alarm Indicators	Indicates the color of the alarm: RED and YELLOW.
3	**Silence/ Reset**	Used to silence an alarm and, if the cause has been eliminated, reset it.
4	**Suspend**	Used to switch all alarms on/off.
5	Alarms Off Indicator	Indicates that all alarms have been shut off.
6	**Alarms/Volume**	Used to turn all alarms off/on and individual alarms on/off, adjust alarm limits and volume, limits, show the alarm messages and go to standby mode.
7	**Other Patients**	Used to view data and alarms between beds.
8	**Monitor Setup**	Used to change settings such as screen displays and patient type, setup OxyCRG (Standard CMS only) and recording and make general configuration changes.
9	**Procedures**	Used to perform Cardiac Output and Wedge Pressure measurements, make ST segment monitoring adjustments, review ST wave segments, admit and discharge patients, or end particular patient case and transfer patient data.
10	**Trends Calc**	Used to view data in graphs and tables, do physiological calculations in graphs, print reports and mark events to view in graphs.
11	**Module Setup**	Used to set up and change settings for all modules that are plugged into the CMS.
12	**Main Screen**	Used to return the standard monitoring screen.
13	**Change Screen**	Used to freeze waves on the screen and change between screen layouts.
14	**Realtime Record**	Used to start a realtime preset recording or a realtime selected recording.
15	**Delayed Record**	Used to start a delayed recording.
16	**Airway Gases Ventilation**	Used to measure airway gases or show ventilator data.
17	Arrow Keys	Used to move highlighting and make selections in the Task Windows - only active when lit.
18	**Confirm**	Used to confirm that the user input is correct - only active when lit.

Main Display Module

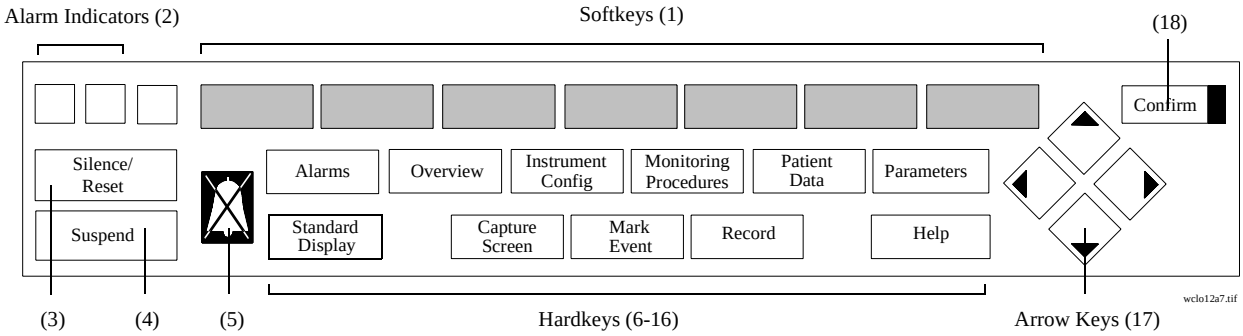


Table 1-4 Classic Control Panel Controls

	Controls	Function
1	Softkey	Selection controls for the softkey labels displayed above them on the screen. Softkeys bring up Task Windows.
2	Alarm Indicators	Indicates the color of the alarm: RED and YELLOW.
3	**Silence/ Reset**	Used to silence an alarm and, if the cause has been eliminated, reset it.
4	**Suspend**	used to switch all alarms on/off.
5	Alarms Off Indicator	Indicates that all alarms have been shut off.
6	**Alarms**	Used to turn all alarms off/on and individual alarms on/off, adjust alarm limits, show the alarm messages and go to standby mode.
7	**Overview**	Used to view data and alarms between beds.
8	**Instrument Config**	Used to setup OxyCRG and recording, change between main screens and combinations of OxyCRG or Split Screen Trending, or to make general configuration changes.
9	**Monitoring Procedures**	Used to perform Cardiac Output and Wedge Pressure measurements, review ST wave segments, admit and discharge patients, or transfer patient data.
10	**Patient Data**	Used to view data in graphs and tables, do physiological calculations in graphs and print reports.
11	**Parameters**	Used to setup and change settings for all modules that are plugged into the CMS.
12	**Standard Display**	Used to return to the standard monitoring screen.
13	**Capture Screen**	Used to freeze the screen.
14	**Mark Event**	Used to display softkeys to mark events you can view in graphs and softkeys for cal signals.
15	**Record**	Used to display softkeys to make delayed recordings or realtime recordings.
16	**Help**	Used to provide information about tasks. NOTE: HELP below softkey label on screen points to item you will get help for.
17	Arrow Keys	Used to move highlighting and make selections in the Task Windows - only active when lit.
18	**Confirm**	Used to confirm that the user input is correct - only active when lit.

Rear Panel Controls and Connectors

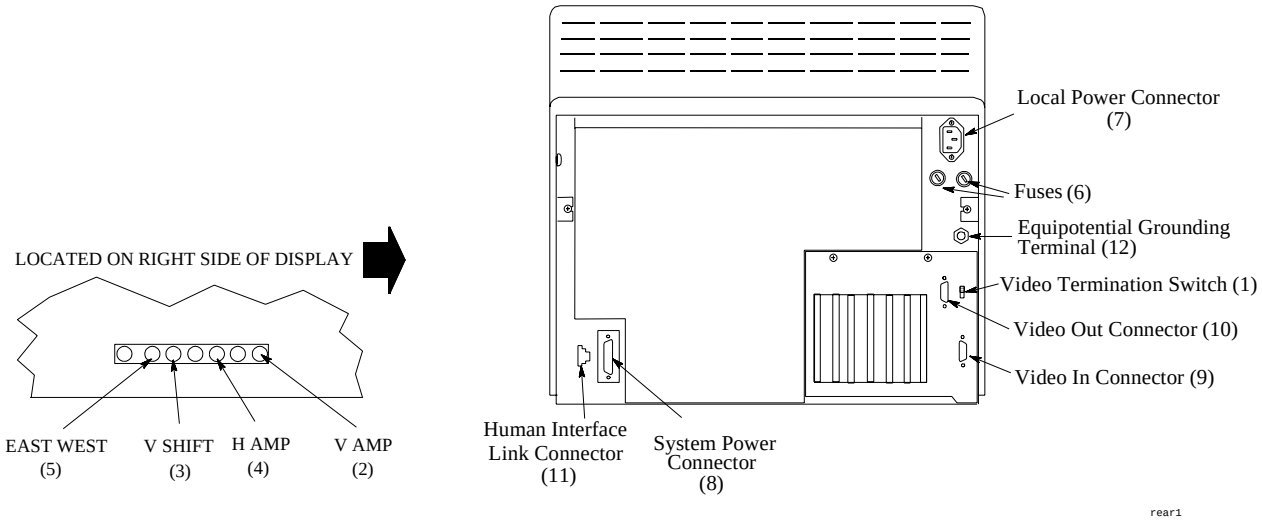


Figure 1-5 Rear Panel of the M1094B Display Module

Table 1-5 Main CRT Display Rear Panel Control and Connectors

	Controls and Connectors	Function
1	Video Termination Switch	Used to terminate the video signal at this display. This must be switched to the **75Ω** position if only a main display is used. When a remote display is connected, the video termination switch on the main display must be switched to **High Imp**.
2	V AMP	Vertical amplitude control, used to adjust the height of the displayed video.
3	V SHIFT	Vertical shift control, used to adjust the vertical position of the displayed video.
4	H AMP	Horizontal amplitude control, used to adjust the width of the displayed video.
5	EAST WEST	Used to adjust the pin-cushion effect of the displayed video.
6	Fuse Holders	Two fuse holders for the line protection fuses, one for the higher operating voltage range and one for the lower operating voltage range.
7	Local Power Connector	3-pin connector, used to input the local line voltage.
8	System Power Connector	15-pin “D” type connector, used to output the 60V dc supply to a similar connector on the DC/DC converter in the rear of the Computer Module.
9	Video In Connector	9-pin “D” type connector, used to input the video signal to be displayed from the display controller in the Computer Module (DSPC for monochrome or CDSPC-Video for color).
10	Video Out Connector	9-pin “D” type connector, used to output the video signal to be displayed on a slave display.

Table 1-5 Main CRT Display Rear Panel Control and Connectors

	Controls and Connectors	Function
11	Human Interface Link Connector	Human Interface Link (HIL) connector, used to output the information from the Control Panel and the Handheld Keypad to the Utility CPU function card in the Computer Module.
12	Equipotential Grounding Terminal	Grounding stud connector, used to connect the Display Module to an equipotential grounding system, if required. The overall system is normally grounded at the grounding terminal on the Computer Module.

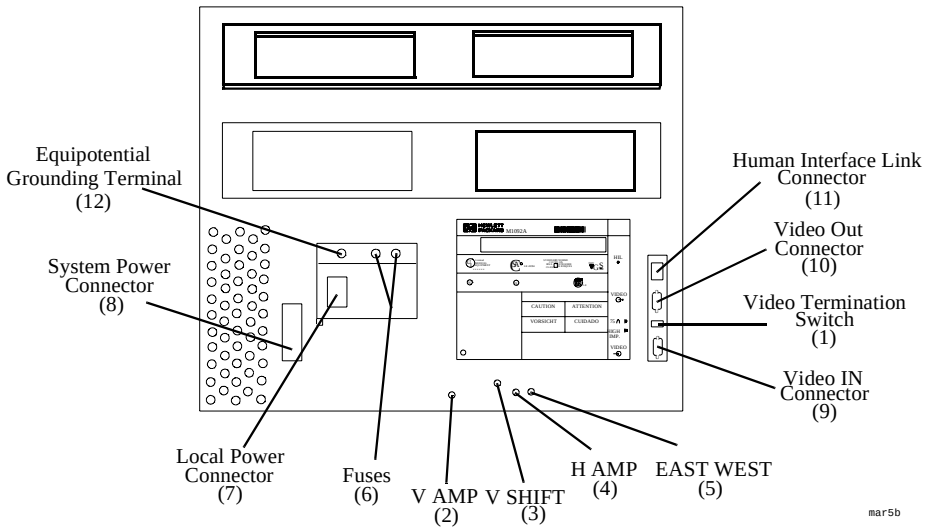


Figure 1-6 Rear Panel of the M1092A & M1094A Main Display Modules

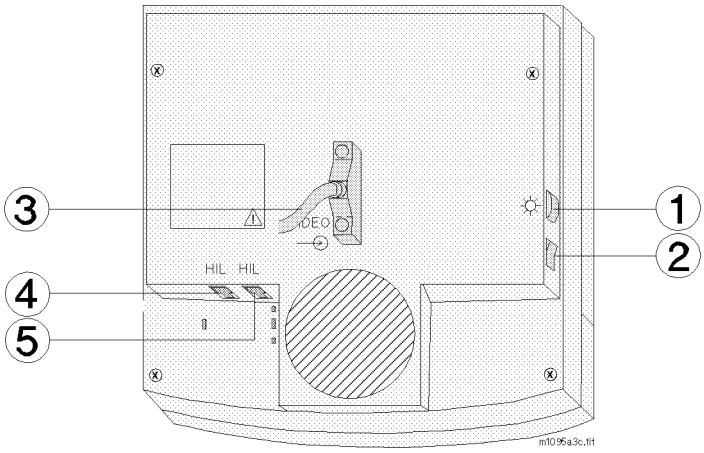


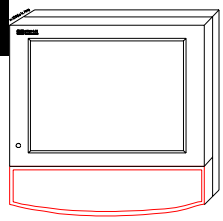
Figure 1-7 Rear Panel of the M1095A Main Display Module

Slave Display Module

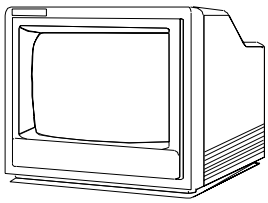
Table 1-6 Flatscreen Rear Panel Controls and Connectors

	Controls and Connectors	Function
1	Brightness Control	Adjusts the brightness of the display.
2	ON/OFF Switch	Used to turn the display On/Off and used as the remote switch for either the M1047A Remote Power Supply or the M1046B Computer Module integral power supply.
3	Combined Video In / Power Connector	This is a male SCSI connector with 25 pin pairs used to input the video signal and the 60 V DC line voltage.
4	Human Interface Link Connector In	This Human Interface Link (HIL) connector is used to connect the handheld keypad.
5	Human Interface Link Connector Out	This Human Interface Link (HIL) connector is used to output the information from the handheld keypad and control panel to the Utility CPU function card in the computer module.

Slave Display Module



Independent Flatscreen Display without Control Panel



Independent / Slave CRT Display without Control Panel

The CMS supports additional displays as either CRT Slave or Flatscreen and CRT Independent Display Modules. CRT Slave Displays connect directly to any CRT and display the same information as the CRT they are connected to. Independent Displays have their own display controller in the Computer Module and may display different information than the Main Display under software control. Slave and Independent Displays are intended as a visual reference and do not have a Control Panel. The information on the 21" slave display can be found in its accompanying manual. See also the Appendix, “Remote 21" Displays”.

14" Slave Display Front Panel Controls

Table 1-7 Slave Display Front Panel Controls

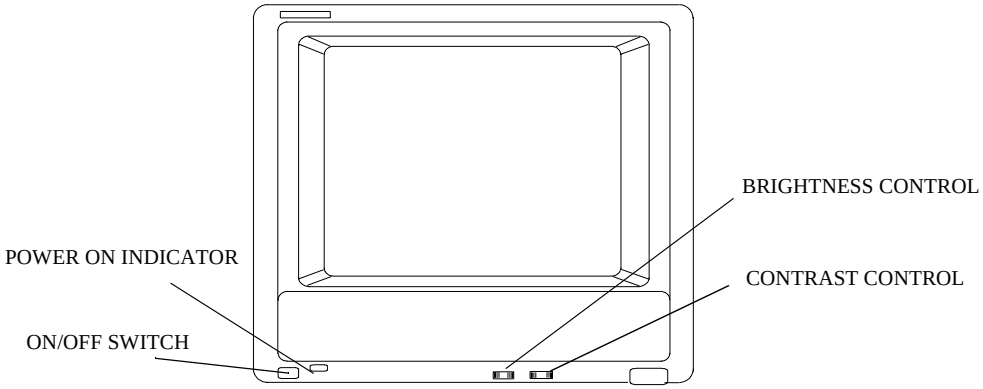
Controls	Function
ON/OFF Switch	Push button switch, used to turn the slave display ON and OFF. This must be pushed in for power ON.
Power ON indicator	Green LED which is lit when the display is switched ON.
Brightness Control	Rotary control, used to vary the brightness of the display.
Contrast Control	Rotary control, used to vary the contrast of the display.

14" Slave Display Rear Panel Controls and Connectors

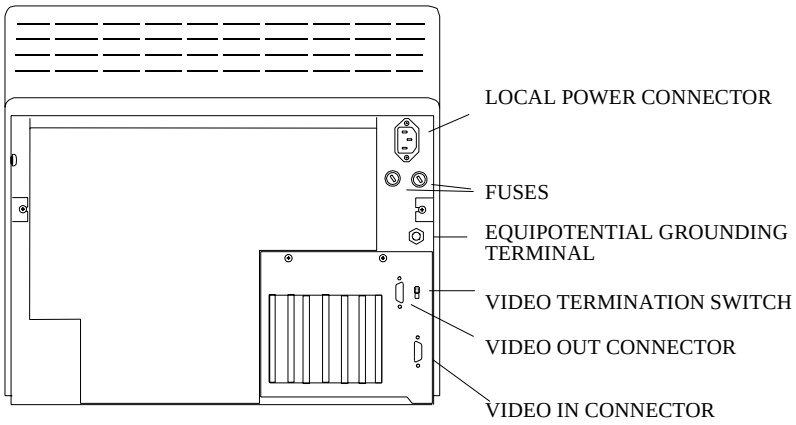
Table 1-8 Slave Display Rear Panel Controls and Connectors

Controls and Connectors	Function
Video Termination Switch	Push button switch, used to terminate the video signal at this display. This switch must be ON (in) or **75**Ω if the slave display is the last in the chain. Otherwise the switch must be OFF (out) or **High Imp**.
Fuse Holders	Holders for the line protection fuses.
Local Power Connector	3-pin connector, used to input the local line voltage.
Video In Connector	Male 9-pin “D” type connector, used to input the video signal to be displayed from the main Display Module.
Video Out Connector	9-pin “D” type connector, used to output the video signal to be displayed on another Slave Display Module.
Equipotential Grounding Terminal	Grounding stud connector, used to connect the system to an equipotential grounding system.

Front Panel



Rear Panel of M1094B



Rear Panel of M1092A and M1094A

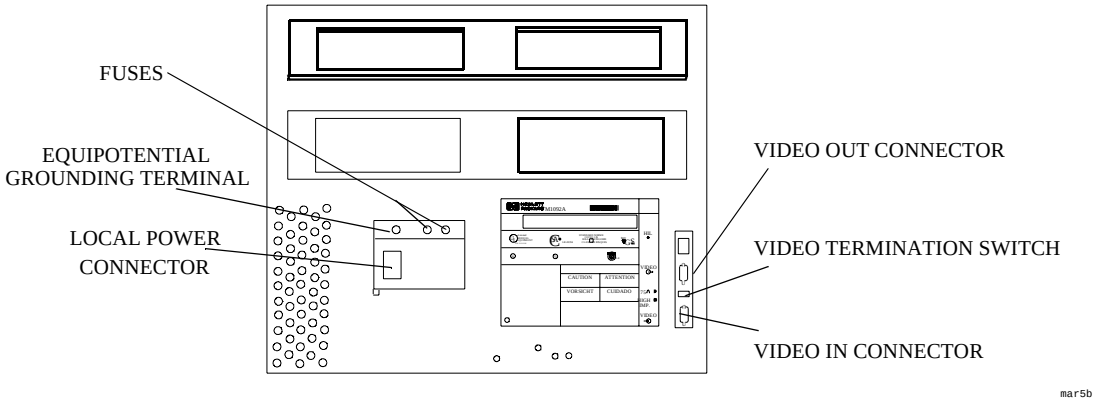
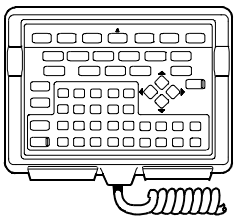


Figure 1-8 Slave Display Controls and Connectors

Handheld Keypad



Handheld Keypad

The Handheld Keypad of the CMS is an external device used for inputting patient information and working with the drug calculator that is a part of the monitor. There are three released versions of the Handheld Keypad. The first release (M1106A) is called the Classic Handheld Keypad. The second release (M1106B) added the SUSPEND hardkey to the Classic Handheld Keypad. The current release (M1106C) is called the Standard Handheld Keypad and it contains the same number of keys as the M1106B but improves on the hardkey key labels and functionality to make them more user-friendly.

Note: Only the Standard Handheld Keypad (M1106C) is supported with Release B.0. The Classic Handheld Keypad (M1106A or M1106B) is not supported for use with Release B.0.

Objective

In order to meet this section's goals, you should be able to:

• Identify the controls and connectors of the Handheld Keypad.

• Be familiar with the function of the controls and connectors of the Handheld Keypad.

Concepts

The Handheld Keypad provides remote access to all monitoring tasks. There are 55 domed buttons on the membrane keyboard which provides a fluid seal to make cleaning easier. A coiled cable is used to connect the keypad to the master or main display, or to the External Alarm Device.

Membrane Keypad	The plastic bezel on the front of the Handheld Keypad that contains the controls and connectors, including the Control Panel and alphanumeric keypad.
Standard Control Panel	The hardkeys, softkeys and alarm indicators of the Standard user interface (Release E or later).
Classic Control Panel	The hardkeys, softkeys and alarm indicators of the Classic user interface. Available with and without the SUSPEND key (see Parts List).
HIL Connector	Human Interface Link (HIL) Connector is used to connect the Handheld Keypad to the Main Display, or to the External Alarm Device. Information is transferred to the system using Philips HIL protocol.
Alphanumeric Keys	These are single-press keys used to input patient information and drug calculations into the monitor.

Handheld Keypad Membrane Keyboard

All of the softkeys and hardkeys on the Display Module are also found on the Handheld Keypad. See Table 1-3 and Table 1-4 and for descriptions of these keys. In addition, the Philips Handheld Keypad has keys for alphanumeric data entry.

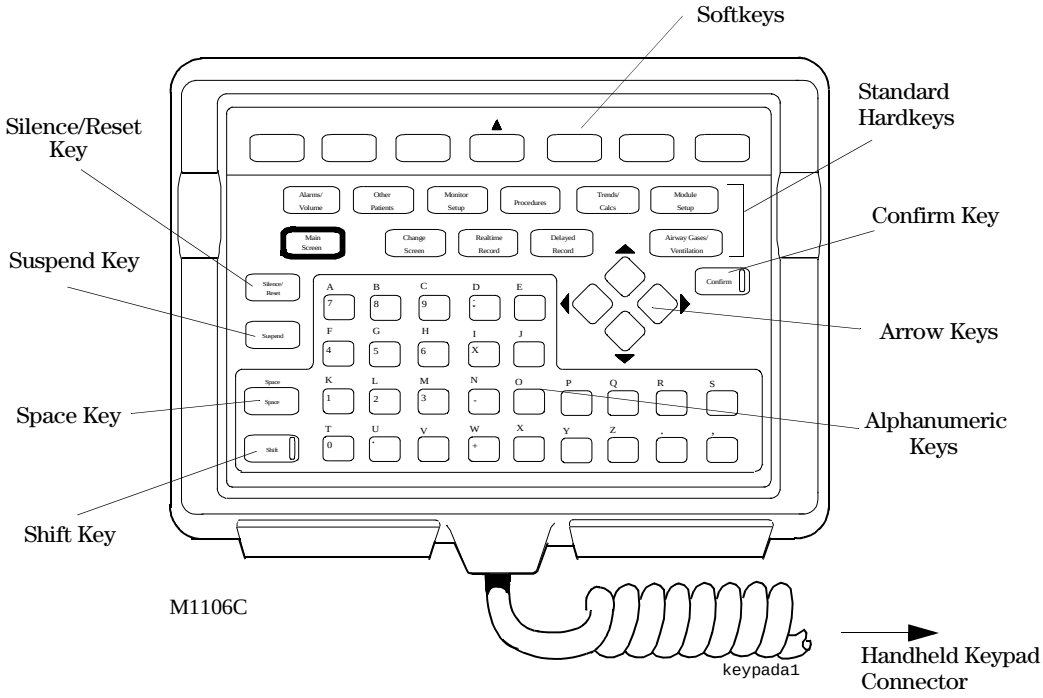


Figure 1-9 Handheld Keypad Controls and Connector

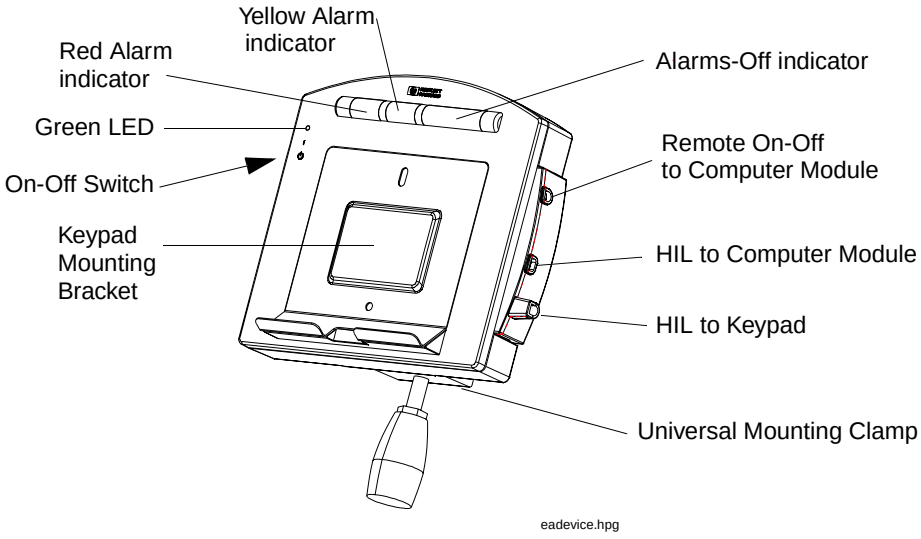
Table 1-9 Handheld Keypad Standard Control Panel

Standard Control Panel	Function
Space	Used to enter spaces between numbers or letters
Shift	Used to switch between alpha and numeric mode. The LED is lit when keypad is in alpha mode.
Alphabet Characters (A - Z)	These characters can be entered only in alpha mode (when the LED on the Shift key is lit).
Punctuation Marks (, .)	The punctuation marks can be entered only in numeric mode (when LED on Shift key is not lit).
Numeric Characters (0 - 9)	These characters can be entered only in numeric mode (when LED on Shift key is not lit).
Arithmetic Operators (+ - * /)	These characters can be entered only in numeric mode (when LED on Shift key is not lit).
Decimal Point (.)	The decimal point can be entered only in numeric mode (when LED on Shift key is not lit).
Handheld Keypad Connector (Philips-HIL)	This connector fits into the Philips-HIL connector on the lower right corner of the Display Module.

Handheld Keypad Rear Cover

The rear cover of the Handheld Keypad contains a magnet to secure it to the keypad mounting bracket or to the External Alarm Device.

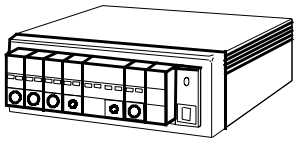
External Alarm Device M1109A



The External Alarm Device, for use with off-the-shelf XGA displays, provides visual and audible alarm indicators. It has a bracket to hold the Handheld Keypad. It also provides an on/off switch to remotely control the M1046B CMS Computer Module.

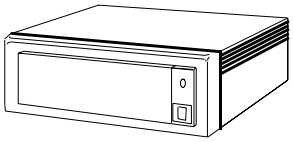
CAUTION **Always locate this device in such a way that the speaker at the rear and the lights on the front are not blocked.**

Computer Module



Computer Module (M1046A) with integral rack

The Computer Module of the CMS contains the hardware and software for the processing functions of the monitor. It can be thought of as the heart of the system. It distributes all the power, clocks and data for the whole system. There are several released configurations for the function cards of the Computer Module. Your configuration will depend on the version of software and hardware your monitor is running and the options it is supporting. All of the function cards connect to the Computer Module backplane, whether from the front or from the rear of the unit. Function cards that require external connections are located in the rear of the Computer Module.

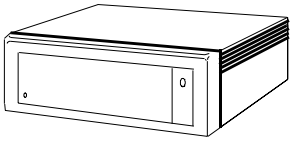


Computer Module (M1046A) with integral blank rack

Objective

In order to meet this section's goals, you should be able to:

- Identify the connectors of the Computer Module
- Be familiar with the functions of the Computer Module.



Computer Module (M1046B) with integral power supply

Concepts

The Computer Module of CMS is not fitted with any controls, just connectors. The front of the M1046A Computer Module can be mounted with an integral plug-in module rack or a blank rack. Each rack contains an internal rack connector used to output information from the rack to the Rack Interface function card placed in slot 18 of the computer module. All of the other connections for the Computer Module are in the rear and will depend on the options and revision of your monitor.

Integral Plug-in Module Rack The integral plug-in module rack fits in the front of the Computer Module (M1046A) and holds plug-in modules. It contains a rear connector that is used to output information from the rack to the Computer Module.

Blank Rack The blank rack is used to cover the front of the Computer Module (M1046A) when a satellite plug-in module rack is being used. It contains a rear connector that is used to output information from the rack to the Computer Module.

Integral Power Supply The integral power supply is used to power the Computer Module (M1046B), a satellite plug-in module rack, and a flatscreen main display without the need for a Remote Power Supply. It connects to the REMOTE_SWITCH card in the Computer Module to allow the flatscreen display to control the Computer Module power.

Backplane The backplane of the Computer Module contains the connections for the front and rear function cards.

CPC Flash Port This port is located on the Configurable Processor Card (CPC) in slot 12 and is the connector for the CPC Programming Tool.

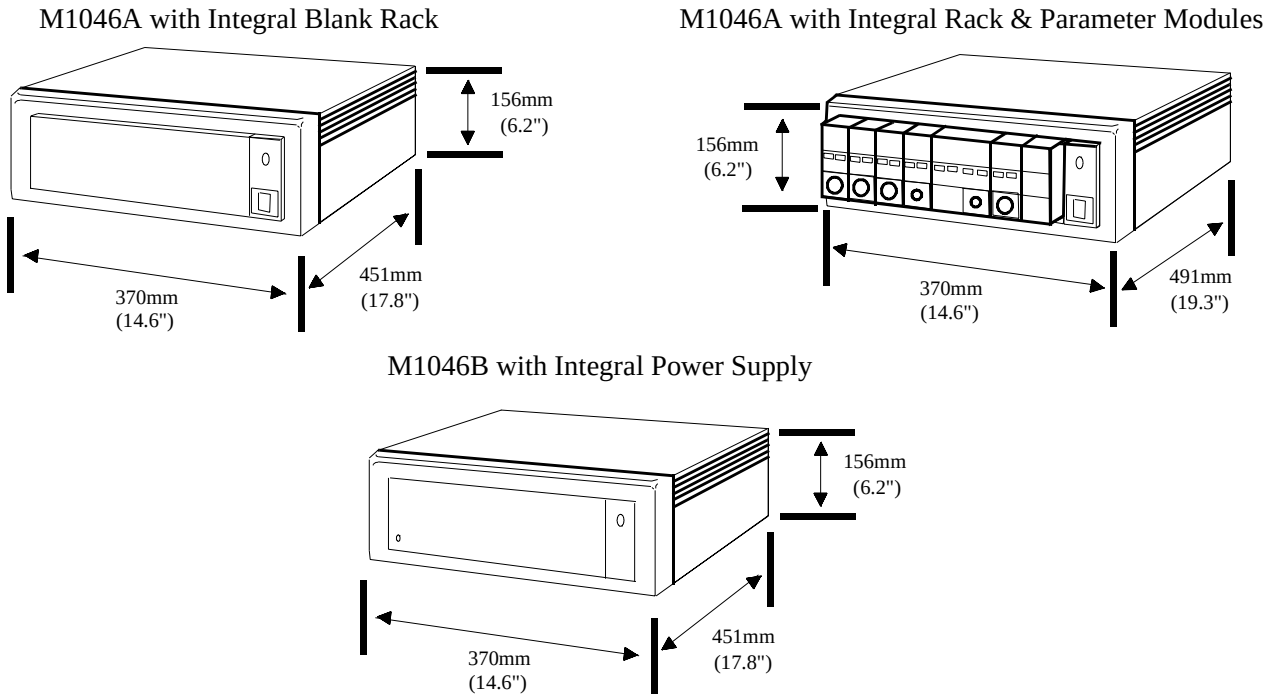


Figure 1-10 Computer Module Dimensions

Brief Functional Overview

The Philips CMS Patient Monitoring System is a loosely coupled multi-processor system containing several CPU cards. They can communicate with each other but do not have access to each other's memory. They can only exchange information in the form of messages.

The backplane can be functionally sectioned into three logical parts or buses, the Message Passing Bus, the Local Bus and the Utility Bus.

Message Passing Bus This is the global communication bus for the system, and is used for communications between CPU cards as well as to intelligent interface cards (for example, RS232 Interface and the display controllers). This bus appears on all the connectors.

Local Bus This is the local communication system. It is a buffered processor bus that allows access to local memory cards, SRAM and EPROM that contain software for the exclusive use of the master processor.

The local bus appears on all the connectors on the backplane but is interrupted to connect groups of connectors into local clusters.

Utility Bus This includes functions required by the whole system; for example, power and clock signal distribution. This bus appears on all the connectors.

Local Clusters The local bus is connected to all the connectors in the backplane but it is interrupted to form clusters that share a connection to the same local bus. There are 10 local clusters in the backplane with varying numbers of connectors.

Delivered Configurations

The versions and models described by this guide are listed as follows (models indicated by asterisk were discontinued. “(S)” indicates a non-US-model):

CMS: M1165A/66A/67A	Models 54(S)*, 56(S), 64(S), 66(S) and 68(S)
CMS: M1175A/76A/77A	Models 54*, 56, 66 and 68
ACMS: M1165A/66A/67A	Models 74(S)*, 76(S), 84(S), 86(S) and 88(S)
ACMS: M1175A/76A/77A	Models 74*, 76, 86 and 88
NCMS: M1165A/66A/67A	Models 34(S)*, 36(S)*, 44(S), 46(S)* and 48(S)
NCMS: M1175A/76A/77A	Models 34*, 36*, 46* and 48

The CMS products M1167A and M1177A use the Computer Module (M1046B).

There are three types of Application CPU Cards used in the Systems: M1054 (10 MHz) and M1051 (15 MHz) and M1053 (40 MHz CPC Card).

Function Card placement in the Backplane is dependent upon the variant of the System and the type of Application CPU Cards. Card placements for all variants of the CMS are illustrated in Table 1-10 Function Card Placement on page 1-23

Function Cards of the Computer Module

The function cards are interconnected by the backplane within the Computer Module; refer to the *Concepts Guide* for a full functional description of the backplane and its theory of operation. The function cards are mounted on both sides of the backplane and may be located either in the front of the Computer Module (even-numbered connectors) or the rear (odd-numbered connectors). The local clusters of the backplane are color-coded on the Computer Module, so that they can be easily identified. On the rear of the backplane, to the left of connector 21, there is a triple-sized gap. This is the only place where the dc-dc converter can be located.

The newer Computer Module (M1046B) has an integral power supply. As a result these Computer Modules have additional function cards. These additional cards are described in Table 1-10 Function Card Placement on page 1-23.

Function Card Placement

Function Card Placement in the backplane of the Philips monitor is dependent upon the following ("(S)" indicates the non-US-models):

1.The monitor model:

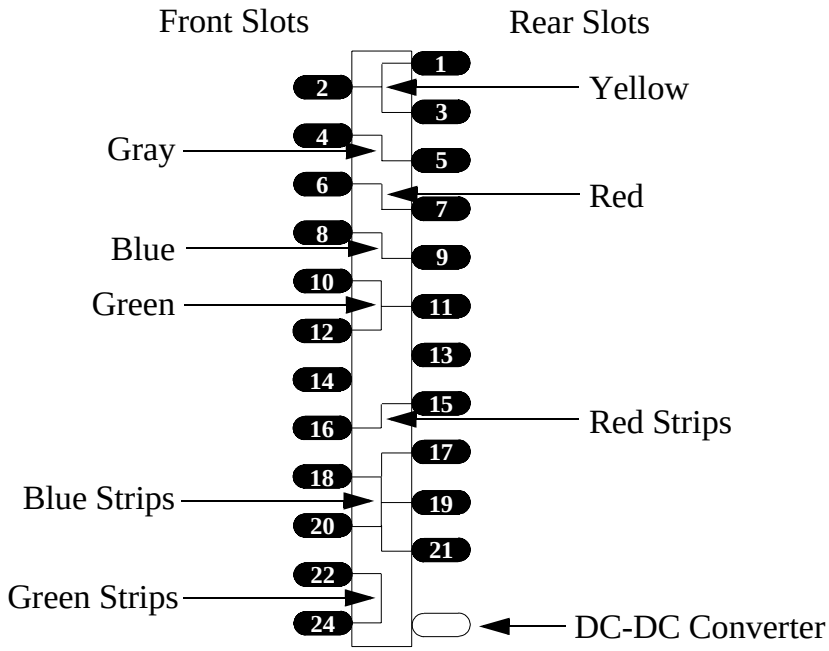
- CMS**:** Models 54 (S), 56 (S), 64 (S), 66 (S), 68 (S)
- ACMS**:** Models 74 (S), 76 (S), 84 (S), 86 (S), 88 (S)
- **NCMS:** Models 36 (S), 44 (S), 46 (S), 48 (S)

2.Type of processor cards used:

- 10 MHz CPU cards M1054-66501
- 15 MHz CPU cards M1051-66501
- 40 MHz CPC card M1053-66515

3.Type and combination of display controllers used:

- M1066-66501 DSPC (Monochrome)
- M1066-66531 DSPC (Monochrome)
- M1066-66543 DSPC (Monochrome with integrated DSPC-lang)
- M1072-66521 CDSPC-CTRL (Color) together with M1072-66501 CDSPC-VIDEO
- M1072-66531 CDSPC (Color)
- M1072-66543 (Color with integrated DSPC-lang)
- M1074-66501 DSPC-FLAT (Flatscreen color)
- M1074-66502 DSPC-FLAT (Flatscreen color)
- M1074-66503 DSPC-FLAT (Flatscreen Color with integrated DSPC-lang)
- M1075-66503 XGA DSPC (XGA with integrated DSPC-lang)

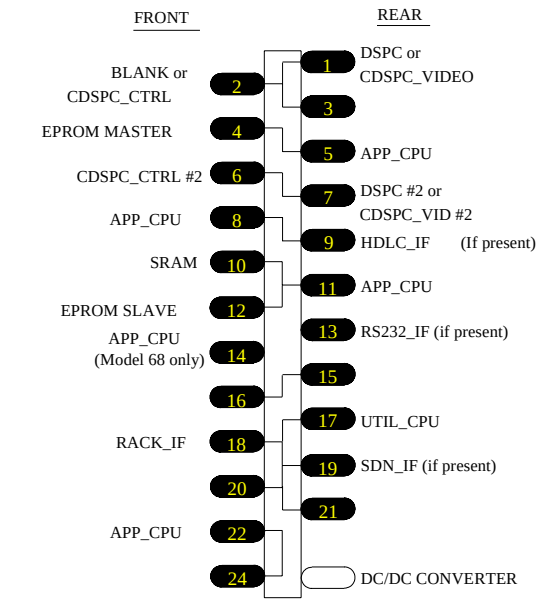


Use the following tables to determine the location of the function cards for your system.

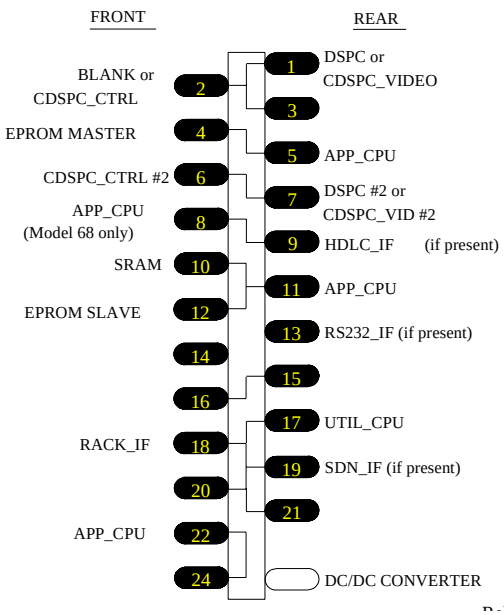
Table 1-10 Function Card Placement

Software Release A

Using 10MHz Application CPUs



Using 15MHz Application CPUs

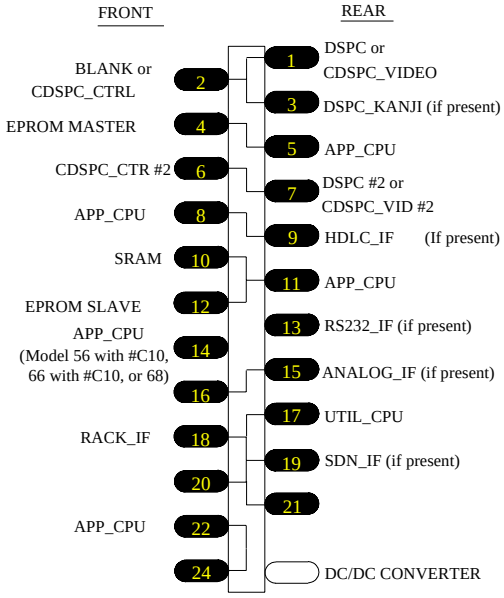


Computer Module

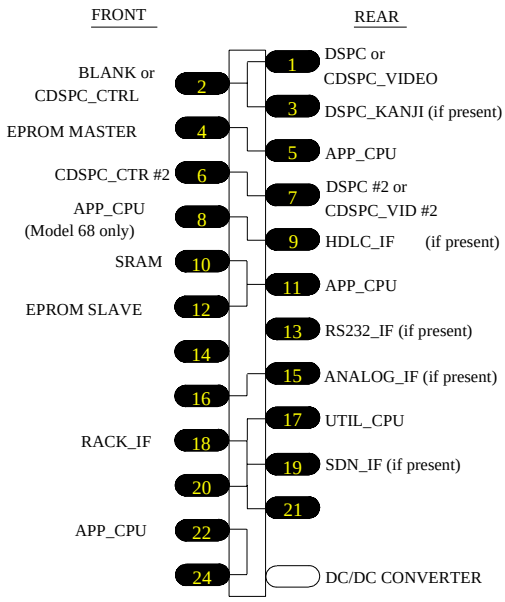
Table 1-10 Function Card Placement

Software Release B

Using 10MHz Application CPUs



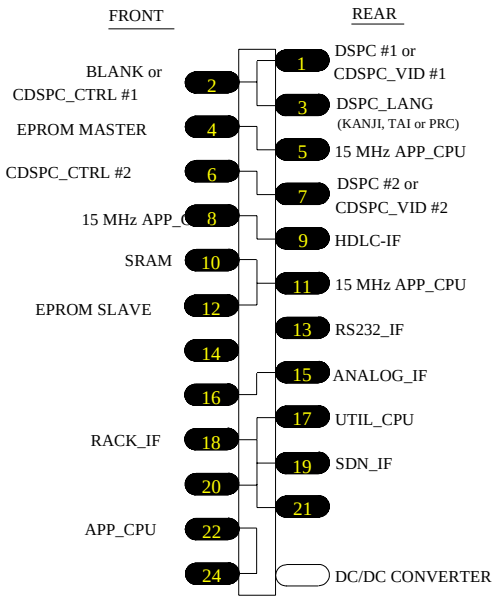
Using 15MHz Application CPUs



Rel_b.mif

Software Release C (15 MHz APP_CPUs)

Models 54(S)/64(S) and Models 56(S)/66(S) without #C26



Models 56(S)/66(S) with #C26 and Model 68(S)

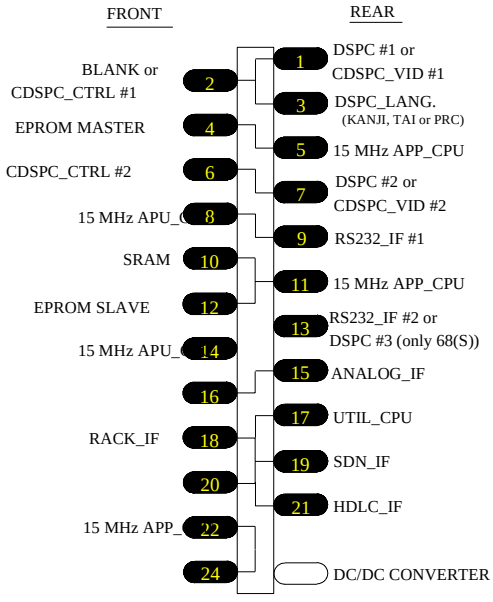


Table 1-10 Function Card Placement

Upgrade Backplane to Release C (without CPC)

The table below shows the slot locations and quantity of 10 MHz (M1054-66501) and 15 MHz (M1051-66501) APP_CPUs for those Philips CMS Patient Monitoring System that have been upgraded from software release A or B with 10 MHz CPU's exclusively, to software release C *without* CPC.

APP_CPU Slot Location and Quantity

A54S/A66S	5[1], 8, 11, 14, 22
A56S,/A66S	5[1], 8, 11, 14, 22
A56(S)/A66(S) (#C10)	5[1], 8, 11, 14, 16[2], 22
A56(S)/A66(S) (#C26)	5[1], 8, 11, 14, 16[1], 22

1 This is a 15 MHz CPU.
2 The systems that have been upgraded from software release B to software release C with existing C10 will contain a 10 MHz processor in slot 16. If C10 is added to a Software Release C monitor, there will not be a 10 MHz processor in slot 16.

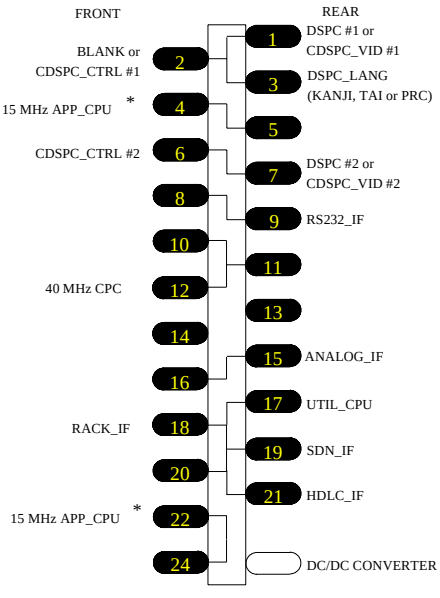
Rel. C+ to Rel. G 15 MHz APP_CPU Requirements

Model	Slot 22	Slot 4
Standard CMS		
A68(S)	Required	Extra card
A56(S)/A66(S)	Required[a]	Extra card
A54(S)/A64(S)	Extra card	Extra card
Anesthesia CMS (from Rel. $E_{ß}$)		
A88(S)	Required	Required
A76(S)/A86(S) (#C25)	Required	Required
A76(S)/A86(S) without (#C25)	Extra card	Extra card
A74(S)/A84(S) (#C24)	Required	Extra card
A74(S)/A84(S) w/o (#C24)	Extra card	Extra card
Neonatal CMS (from Rel. F)		
A36(S)/A46(S)/A48(S)	Required	Extra card

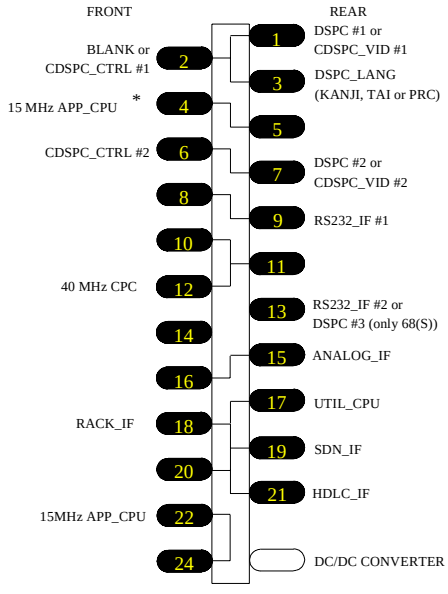
a. Not required in certain earlier releases.

Software Release C+ or D (40 MHz CPC)

Models 54(S)/64(S) and Models 56(S)/66(S)



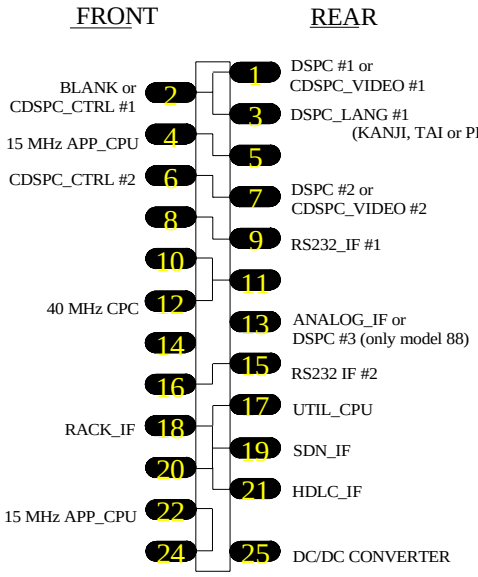
Models 56(S)/66(S) with #C26 and Model 68(S)



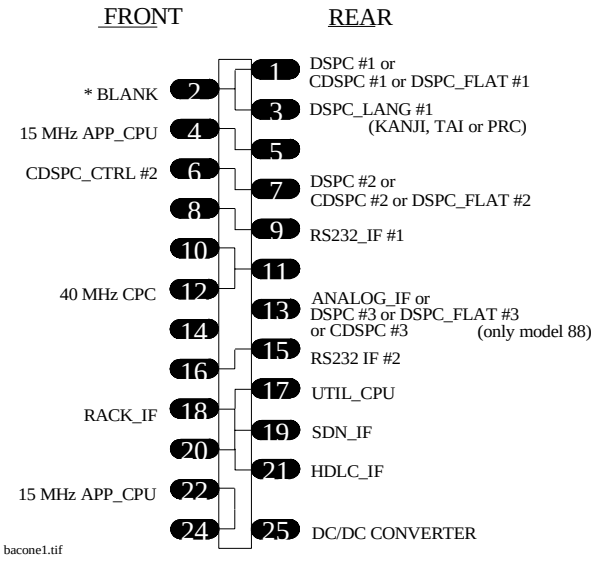
* An extra CPU may be left in for future use.

Table 1-10 Function Card Placement

Software Release E or E_{β}



Software Release F

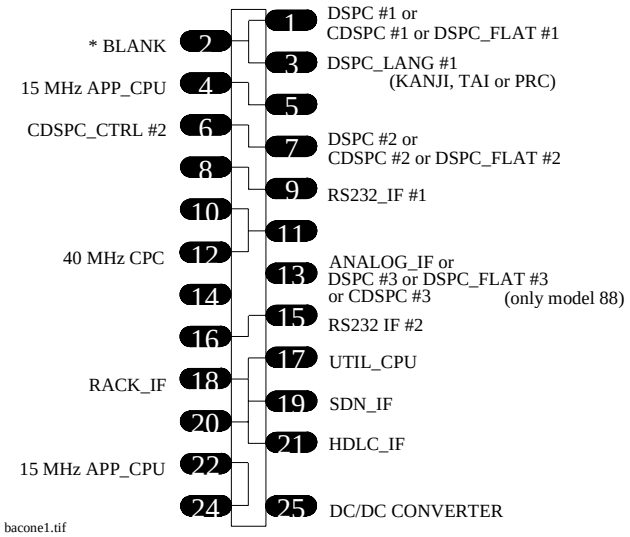


bacone1.tif

* If upgraded (to F) may still have CDSPC_CTRL #1.

Software Release G

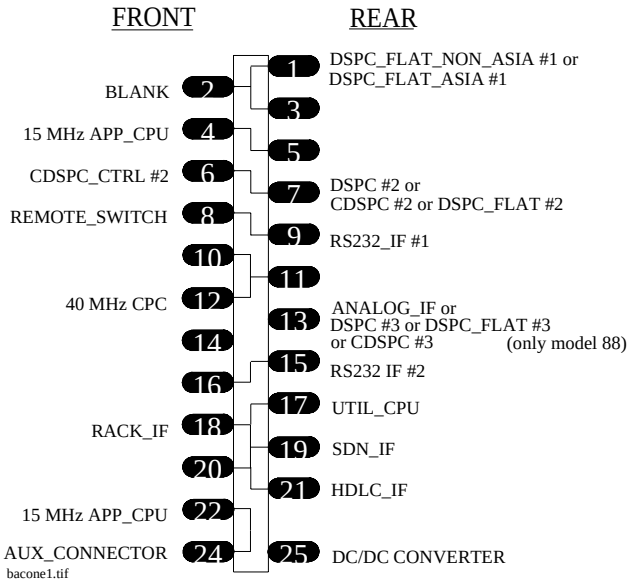
M1046A Computer Module



bacone1.tif

* If upgraded (to G) may still have CDSPC_CTRL #1.

M1046B Computer Module



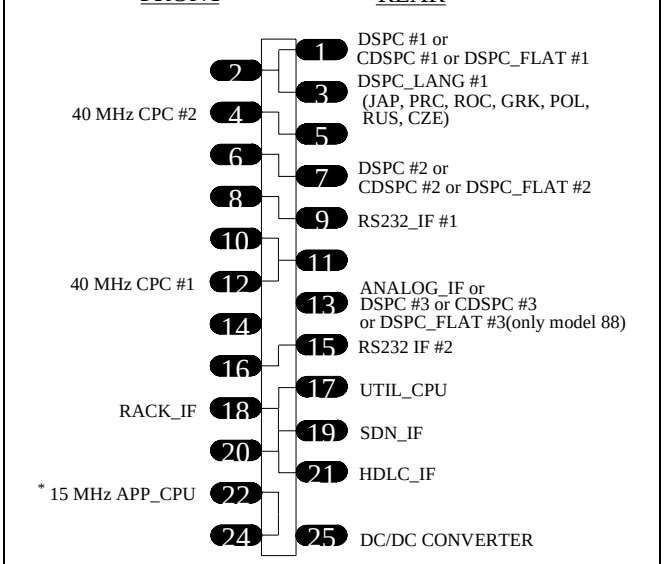
bacone1.tif

Table 1-10 Function Card Placement

Software Releases A.0 to C.0

M1046A Computer Module

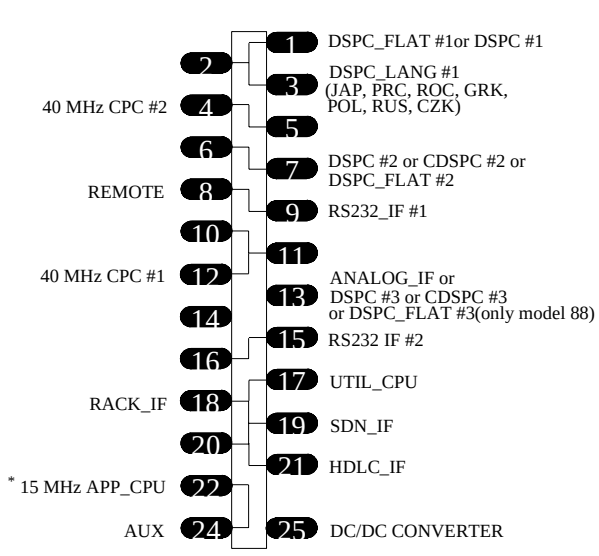
Systems with M1066-66531 or M1066-66543** (DSPC) or
M1072-66531 or M1072-66543** (CDSPC) or
M1074-66501 (DSPC_FLAT) or
M1074-66502 (DSPC_FLAT)**



*For future use – if upgraded ** with these controllers no DSPC_LANG is required

M1046B Computer Module

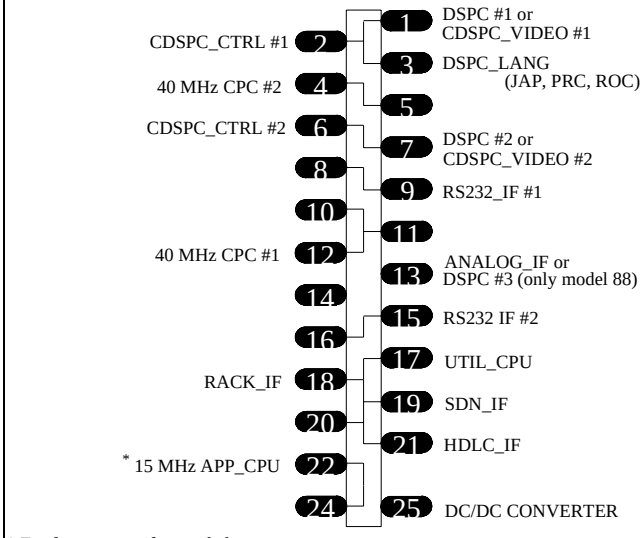
Systems with M1074-66501(DSPC_FLAT) or
M1074-66502 (DSPC_FLAT)



*For future use – if upgraded

M1046A Computer Module

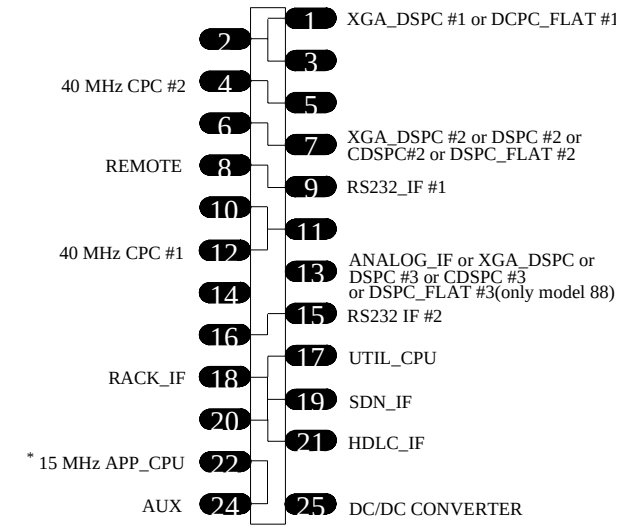
Systems with M1066-66501 (DSPC) or
M1072-66521 (CDSPC_CTRL) +
M1072-66501 (CDSPC_VIDEO)



* For future use – if upgraded.

M1046B Computer Module

Systems with M1075-66503 (XGA_DSPC) or
M1074-66503 (DSPC_FLAT)



* For future use – if upgraded.

EEPROM Numbers

The part numbers listed in the table below are for cross-reference purposes only. Order a blank EEPROM (1818-4869) and reprogram it using the relevant upgrade programming tool.

Table 1-11 CMS EEPROM/CPU Matrix (M1059-85xxx) Releases A to G

CMS Model XX	10MHz Monitors			15 MHz Monitors			40 MHz CPC Monitors					
	Rel A	Rel B	Rel C	Rel A	Rel B	Rel C	Rel C	Rel D	Rel E	Rel Eβ	Rel F	Rel G
A54(S)/A64(S)	`231	'251	'301	`241	`261	'341	'441	'541	‘641	‘741	‘841	‘943
A54(S)/A64(S) (C02)	`234	'254	'301	`244	`264	'341	'441	'541	‘641	‘741	‘841	‘943
A54(S)/A64(S) (C03)	'237	'257	-	'247	`267	-	-	-	-	-	-	-
A54(S)/A64(S) (C05)	-	-	'303	-	-	'343	'443	'543	‘643	‘743	‘843	‘943
A54(S)/A64(S) (C10)	-	'271	'304	-	`281	'344	'444	'544	‘644	‘744	‘844	‘949
A54(S)/A64(S) (C02,C10)	-	'274	'304	-	'284	'344	'444	'544	‘644	‘744	‘844	‘949
A54(S)/A64(S) (C03,C10)	-	'277	-	-	'287	-	-	-	-	-	-	-
A54(S)/A64(S) (C05,C10)	-	-	'309	-	-	'349	'449	'549	‘649	'749	‘849	‘949
A56(S)/A66(S)	`232	'255	'321	`242	`265	'361	'461	'561	‘661	‘761	‘861	‘963
A56(S)/A66(S) (C02)	`235	`255	'321	`245	`265	'361	'461	'561	‘661	‘761	‘861	‘963
A56(S)/A66(S) (C03)	'238	'258	'322	`248	`268	'362	'462	'562	‘662	‘762	‘862	‘966
A56(S)/A66(S) (C05)	-	-	'323	-	-	'363	'463	'563	‘663	‘763	‘863	‘963
A56(S)/A66(S) (C10)	-	'275	'324	-	`285	'364	'464	'564	‘664	‘764	‘864	‘969
A56(S)/A66(S) (C26)	-	-	'325	-	-	'365	'465	'565	-	-	-	-
A56(S)/A66(S) (C03,C05)	-	-	'326	-	-	'366	'466	'566	‘666	‘766	‘866	‘966
A56(S)/A66(S) (C03,C10)	-	'278	'327	-	'288	'367	'467	'567	‘667	‘767	‘867	‘971
A56(S)/A66(S) (C03,C26)	-	-	'328	-	-	'368	'468	'568	-	-	-	-
A56(S)/A66(S) (C05,C10)	-	-	'329	-	-	'369	'469	'569	‘669	‘769	‘869	‘969
A56(S)/A66(S) (C10,C26)	-	-	'330	-	-	'370	'470	'570	-	-	-	-
A56(S)/A66(S) (C03,C05,C10)	-	-	'331	-	-	'371	'471	'571	‘671	‘771	‘871	‘971
A56(S)/A66(S) (C03,C10,C26)	-	-	'332	-	-	'372	'472	'572	-	-	-	-
A68(S)	`233	'256	-	`243	`266	'381	'481	'581	‘681	‘781	‘881	‘981
A68(S) (C02)	`236	'256	-	`246	'266	'381	'481	'581	‘681	‘781	‘881	‘981
A68(S) (C03)	'239	'259	-	`249	`269	'382	'482	'582	‘681	‘781	‘881	‘981
A68(S) (C10)	-	'276	-	-	`286	'384	'484	'584	‘681	‘781	‘881	‘981
A68(S) (C03,C10)	-	'279		-	`289	'387	'487	'587	‘681	‘781	‘881	‘981

Table 1-12 CMS EEPROM/CPU Matrix (M1059-xxxxx) Releases A.0 to C.0

System Model	Options	Rel. A.0	Rel. B.0	Rel. C.0	Rel. C.1
64/64S	Standard	-80040	-80140	-80242	-80342
	C04	-80041	-80141	-80243	-80343
	C12	—	-80142	-80242	-80342
	C04, C12	—	-80143	-80243	-80343
	C80	-80042	-80140	-80242	-80342
	C04, C80	-80043	-80141	-80243	-80343
56/56S and 66/66S (Rel.B.0 and C.0)	Standard	-80060	-80160	-80262	-80362
	C04	-80061	-80161	-80263	-80363
	C12	—	-80162	-80262	-80362
	C04, C12	—	-80163	-80263	-80363
	C80	-80062	-80160	-80262	-80362
	C04, C80	-80063	-80161	-80263	-80363
	J26	-80070	-80170	-80272	-80372
	J26, C04	-80071	-80171	-80273	-80373
	J26, C32	—	—	-80274	-80374
	J26, C04, C32	—	—	-80275	-80375
	J26, C12	—	-80172	-80272	-80372
	J26, C04, C12	—	-80173	-80273	-80373
	J26, C80	-80072	-80170	-80272	-80372
	J26, C04, C80	-80073	-80171	-80273	-80373
68/68S	Standard	-80080	-80180	-80282	-80382
	C04	-80081	-80101	-80283	-80383
	C12	—	-80182	-80282	-80382
	C80	—	—	-80282	-80382
	C04, C80	-80083	-80101	-80283	-80383
	J28	-80090	-80190	-80292	-80392
	J28, C04	-80091	-80111	-80293	-80393
	J28, C32	—	—	-80294	-80394
	J28, C04, C32	—	—	-80295	-80395
	J28, C12	—	-80192	-80292	-80392
	J28, C80	-80092	-80190	-80292	-80932
	J28, C04, C80	-80093	-80111	-80293	-80393

Table 1-13 ACMS EEPROM/CPU Matrix (M1059-87xxx) Rel. E to G

ACMS Model XX	40 MHz CPC Monitors			
	Rel E	Rel Eβ	Rel F	Rel G
A74(S)/A84(S)	‘641	‘741	‘841	‘943
A74(S)/A84(S) (C05)	‘643	‘743	‘843	‘943
A74(S)/A84(S) (C24)	‘644	‘744	‘844	‘949
A74(S)/A84(S) (C05,C24)	‘649	‘749	‘849	‘949
A76(S)/A86(S)	‘661	‘761	‘861	‘963
A76(S)/A86(S) (C03)	‘662	‘762	‘862	‘966
A76(S)/A86(S) (C05)	‘663	‘763	‘863	‘963
A76(S)/A86(S) (C25)	‘665	‘765	‘865	‘971
A76(S)/A86(S) (C03,C05)	‘666	‘766	‘866	‘966
A76(S)/A86(S) (C03,C25)	‘668	‘768	‘868	‘972
A76(S)/A86(S) (C05,C25)	‘671	‘771	‘871	‘971
A76(S)/A86(S) (C03,C05,C25)	‘672	‘772	‘872	‘972
A88(S)	‘681	‘781	‘881	‘981
A88(S) (C11)		-	‘880	‘980

Table 1-14 ACMS EEPROM/CPU Matrix (M1059-xxxxx) Rel. A.0 to C.0

System Model	Options	Rel. A.0	Rel. B.0	Rel. C.0	Rel. C.1
84/84S (Rel. C.0)	Standard	—	—	-81242	-81342
	C79	—	—	-81243	-81343
76/76S and 86/86S (Rel.B.0 and C.0)	Standard	-81060	-81160	-81262	-81362
	C79	-81061	-81161	-81263	-81363
	C12	—	-81162	-81262	-81362
	C12, C79	—	-81163	-81263	-81363
	C80	-81062	-81160	-81262	-81362
	C80, C79	-81063	-81161	-81263	-81363
	J26	-81070	-81170	-81272	-81372
	J26, C79	-81071	-81171	-81273	-81373
	J26, C12	—	-81172	-81272	-81372
	J26, C12, C79	—	-81173	-81273	-81373
	J26, C80	-81072	-81170	-81272	-81372
	J26, C79, C80	-81073	-81171	-81270	-81370
	J26, C32	—	—	-81274	-81374
	J26, C79, C32	—	—	-81275	-81375
88/88S	Standard	-81080	-81180	-81282	-81382
	C79	-81081	-81181	-81283	-81383
	C12	—	-81182	-81282	-81382
	C12, C79	—	-81183	-81283	-81383
	C80	-81082	-81180	-81282	-81382
	C79, C80	-81083	-81181	-81283	-81383
	J28	-81090	-81190	-81292	-81392
	J28, C79	-81091	-81191	-81293	-81393
	J28, C32	—	—	-81294	-81394
	J28, C32, C79	—	—	-81295	-81395
	J28, C12	—	-81192	-81292	-81392
	J28, C12, C79	—	-81193	-81293	-81393
	J28, C80	-81092	-81190	-81292	-81392
	J28, C79, C80	-81093	-81191	-81293	-81393
	J28, C11	-81095	-81190	-81292	-81392
	J28, C11, C79	-81096	-81191	-81293	-81393
	J28, C11, C80	-81097	-81190	-81292	-81392
	J28, C11, C79, C80	-81098	-81191	-81293	-81393

Table 1-15 NCMS EEPROM/CPU Matrix (M1059-85xxx) Releases F and G

NCMS Model XX	40 MHz CPC Monitors	
	Rel F	Rel G
A36(S)/A46(S)	‘860	‘960
A36(S)/A46(S) (C10)	‘870	‘970
A48(S)	‘880	‘980

Table 1-16 NCMS EEPROM/CPU Matrix (M1059-xxxxx) Releases A.0 to C.0

System Model	Options	Rel. A.0	Rel. B.0	Rel. C.0	Rel. C.1
44/44S	Standard	—	—	-80220	-80320
	C04	—	—	-80221	-80321
48/48S	Standard	-80000	-80100	-80200	-80300
	C04	-80001	-80101	-80201	-80301
	C80	-80002	-80100	-80200	-80300
	C04, C80	-80003	-80103	-80201	-80301
	J28	-80010	-80110	-80210	-80310
	J28, C04	-80011	-80111	-80211	-80311
	J28, C80	-80012	-80110	-80210	-80310
	J28, C04, C80	-80013	-80111	-80211	-80311
	C32	—	—	-80214	-80314
	C04, C32	—	—	-80215	-80315

Front Connectors

The front of the Computer Module contains two function cards with connectors, the Rack Interface card connector in slot 18 and the CPC card connector in slot 12 in later releases. The Rack Interface connector is used to collect output for the Computer Module from the plug-in module rack (integral or blank) and the CPC Flash port is used by the CPC Programming Tool for programming functions. Most models contain a Sheet Metal Cover over the front function cards. The cover has two ports for access to the front connectors.

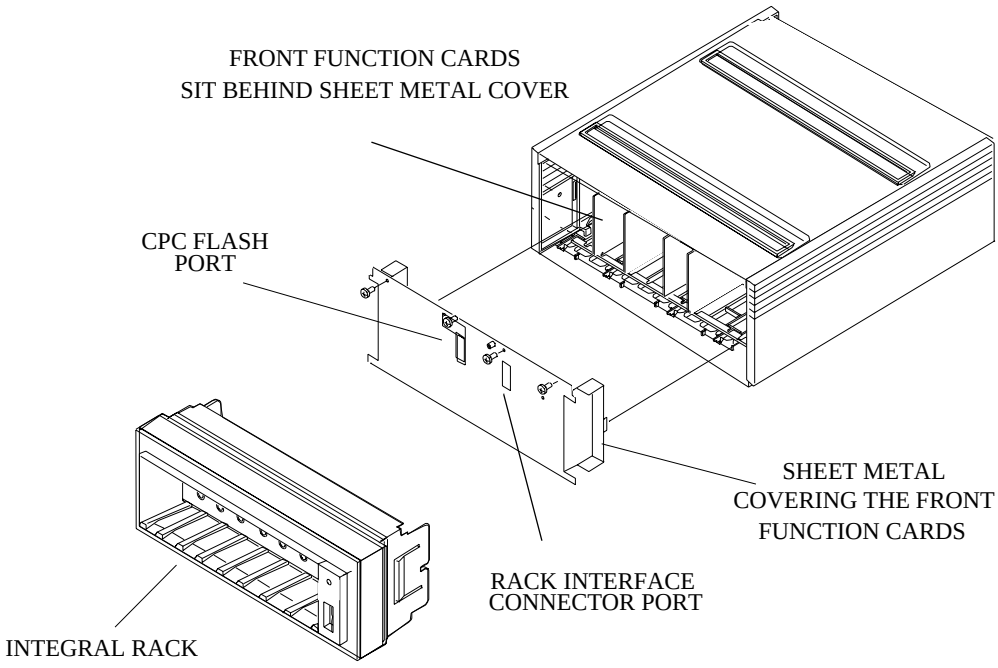


Figure 1-11 M1046A Computer Module Front Connectors

Front Connectors on Computer Module M1046B

There are extra connectors on the front of the M1046B Computer Module with an integral power supply.

Remote Switch This connects the integral power supply to the backplane of the computer module and allows the flatscreen display to control the power for the Computer Module.

FE-Link &ECG sync These connectors are found on the AUX_CONNECTOR card in slot 24 to allow access to the RACK_IF card in slot 18 behind the power supply. An ECG adapter allows you to connect to the ECG sync connector through a hole in the front plastic cover.

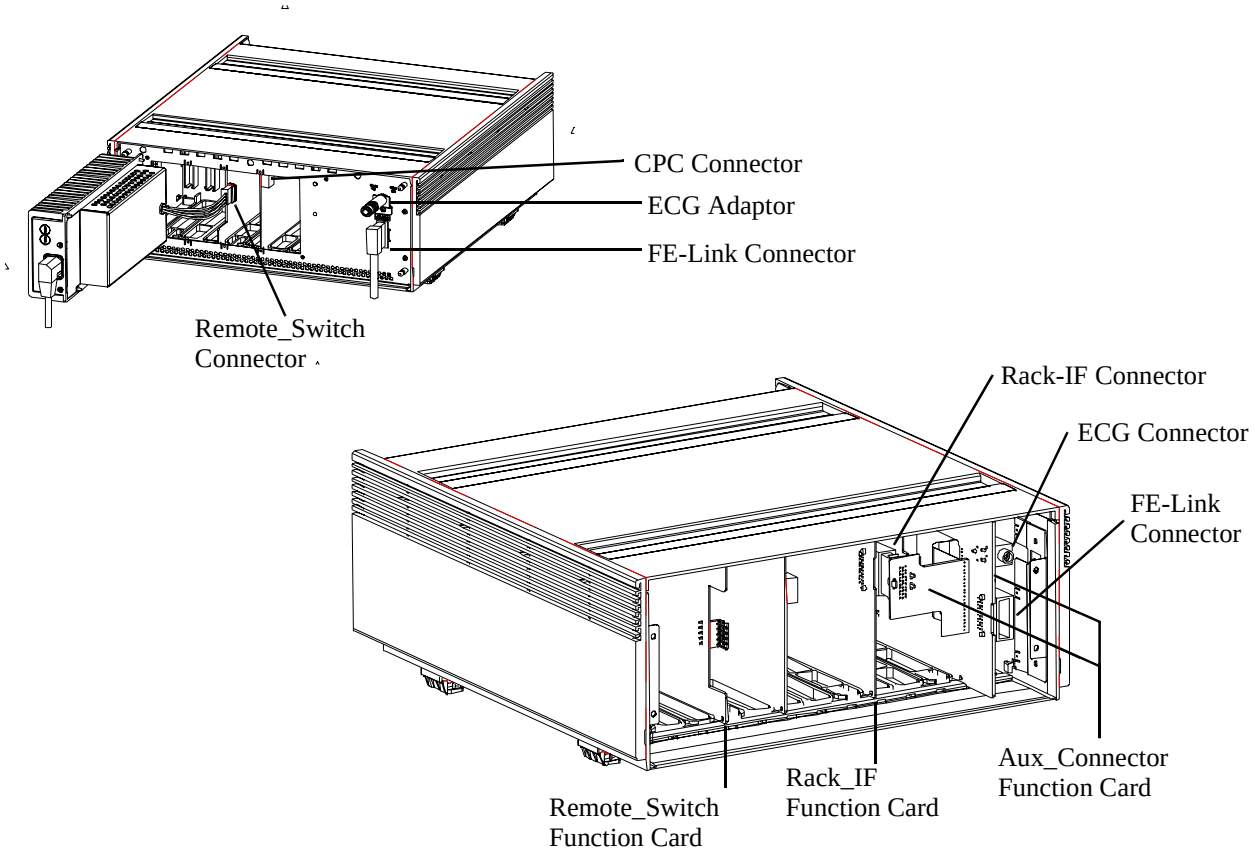


Figure 1-12 M1046B Computer Module Front Connectors

Rear Connectors

The rear panel of the Computer Module will have several connectors. The number and the type of connectors present is dependent upon which function cards are fitted in the Computer Module backplane. Any unused rear backplane function card slots are fitted with blank slot covers. A typical Computer Module rear panel is shown below.

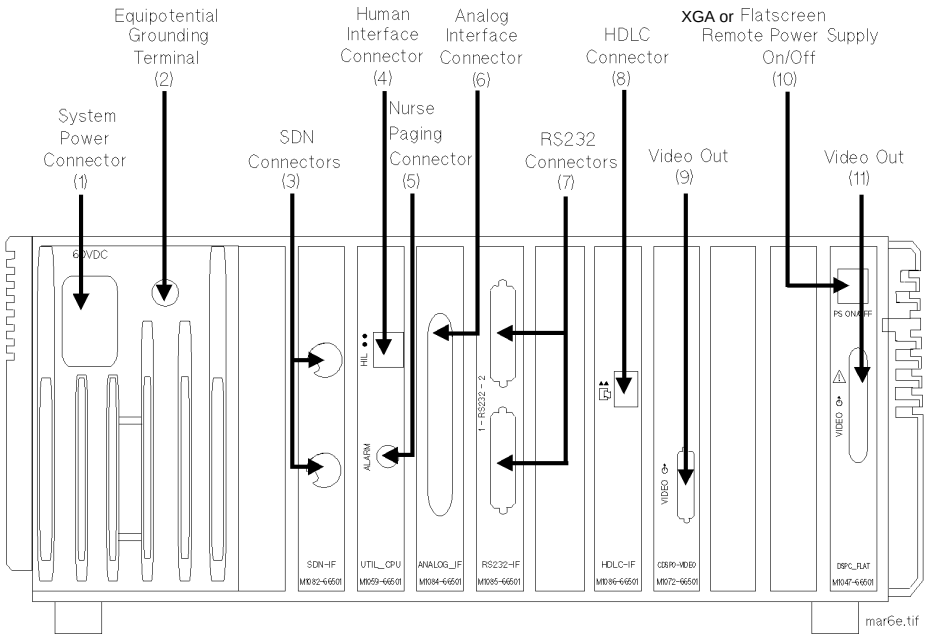


Table 1-17 Computer Module Rear Connectors

	Connector	Function
1	System Power Connector (DC/DC Convertor)	15-pin “D”-type connector, used to input the 60V dc from either a Main CRT Display Module or the Remote Power Supply Module if a flatscreen is used as the main display. **For M1046B:** The 60V dc is supplied from an integral power supply and a shorting stub MUST be installed in this connector for the system to function correctly. **Note:** Daisychaining is not permitted with the M1046B.
2	Equipotential Grounding Terminal	Used to connect the Computer Module to the hospital's grounding system.
3	SDN Connectors (SDN Interface)	Philips connectors, used to input/output information to/from a SDN network.
4	Human Interface Connector (Utility CPU)	Human Interface Link (HIL) connector, used to input the information from the Control Panel in the Main Display Module and the Handheld Keypad.
5	Nurse Paging Relay output	Mini-phone jack, used to connect to the hospital's Nurse Paging System.
6	Analog Interface Connector	37-pin “D” type connector configured as shown in Figure 1-13, used to output information to analog devices.

Table 1-17 Computer Module Rear Connectors

	Connector	Function
7	RS232 Connectors (RS232 Interface)	Two 25-pin "D" type connectors configured as shown in Figure 1-14, used to output information to a printer or computer systems. Only the upper connector (port 2) can be used to output RS232 information to printers.
8	HDLC Connector	Used to connect to a STRIP recorder, M1117A.
9	Video Out Connector (CDSPC-Video or DSPC)	9-pin "D" type connector, used to output information to be displayed on the Display Module. See Table 1-19 on page 1-37 lists the connector pinouts.
10	PS ON/OFF connector (DSPC_Flat or CDSPC-XGA)	Used to control remotely the 60V DC output of the Remote Power Supply Module. **For M1046B** with an integral power supply, this connector is not used except for the XGA display configuration in which it is connected to the External Alarm Device
11	Video Out Connector (Flatscreen or XGA)	Used to output information to be displayed on the Flatscreen Display Module (25-pin) or XGA Display (15-pin), and also to output 60V DC to the Flatscreen Display Module. Table 1-19 Video / Power Connector on page 1-37 lists the connector pinouts.

NOTE

No connection can be made to the following cards:

- APP_ CPU
- CDSPC_CRTL
- EPROM (including character set EPROMs, for example, Kanji)
- SRAM

Computer Module External Connector Pinouts

The following table lists the signals and appropriate notes for the pins on the Video Out Connector (CRT).

Table 1-18 Video Out Connector

Pin\No	Signal	Notes
1	Sync 1	(H sync - positive TTL level)
2	-	
3	Red signal	(1 V peak positive)
4	Green signal	(1 V peak positive)
5	Blue signal	(1 V peak positive)
6	Sync 2	(L sync - positive TTL level)
7	-	
8	-	
9	Ground	

The following table lists the signals for the pins on the Video Out connector (M1095A Flatscreen). For the Video/Power input a male 'SCSI' connector with 25-pin pairs is used.

Note that an XGA display uses a standard 15-pin connector.

Table 1-19 Video / Power Connector

Pin Pair	Signal
1 / 26	Red 0
2 / 27	Red 1
3 / 28	Red 2
4 / 29	Red 3
5 / 30	Green 0
6 / 31	Green 1
7 / 32	Green 2
8 / 33	Green 3
9 / 34	Blue 0
10 / 35	Blue 1
11 / 36	Blue 2
12 / 37	Blue 3
13 / 38	HSYNC
14 / 39	VSYNC
15 / 40	BLANK
16 / 41	Backlight ON/OFF
17 / 42	ID_0 / ID_1
18 / 43	ID_2 / ID_GND
19 / 44	Pixel Clock
20 / 45	GND
21 / 46	free
22 / 47	
23 / 48	FEPWR / FECOM (+60V)
24 / 49	FEPWR / FECOM (+60V)
25 / 50	Remote ON/OFF to Power Supply

Note: The shaded areas are differential signals.

Computer Module

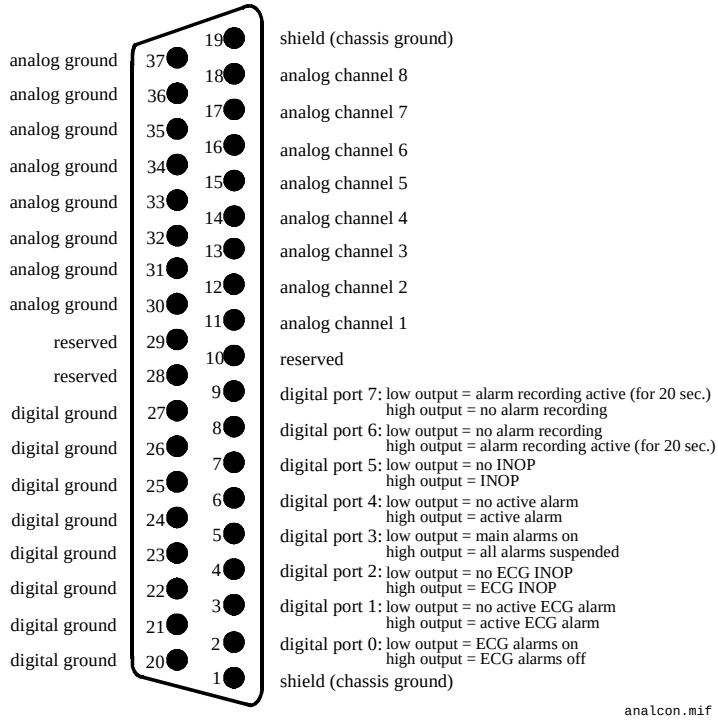

analog ground 37
analog ground 36
analog ground 35
analog ground 34
analog ground 33
analog ground 32
analog ground 31
analog ground 30
reserved 29
reserved 28
digital ground 27
digital ground 26
digital ground 25
digital ground 24
digital ground 23
digital ground 22
digital ground 21
digital ground 20
19 shield (chassis ground)
18 analog channel 8
17 analog channel 7
16 analog channel 6
15 analog channel 5
14 analog channel 4
13 analog channel 3
12 analog channel 2
11 analog channel 1
10 reserved
9 digital port 7: low output = alarm recording active (for 20 sec.) high output = no alarm recording
8 digital port 6: low output = no alarm recording high output = alarm recording active (for 20 sec.)
7 digital port 5: low output = no INOP high output = INOP
6 digital port 4: low output = no active alarm high output = active alarm
5 digital port 3: low output = main alarms on high output = all alarms suspended
4 digital port 2: low output = no ECG INOP high output = ECG INOP
3 digital port 1: low output = no active ECG alarm high output = active ECG alarm
2 digital port 0: low output = ECG alarms on high output = ECG alarms off
1 shield (chassis ground)
analcon.mif

Figure 1-13 Analog Interface Connector

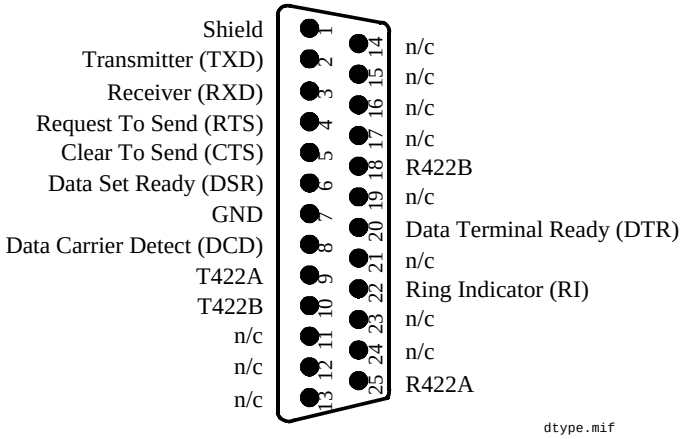


Figure 1-14 RS232 Connector

Mounting the CMS

For the latest mounting options available for your system, please refer to the following website:
http://www3.medical.philips.com/resources/hsg/docs/en-us/custom/pmd_ms_index_generic.asp

Connecting the CMS Cables

Once the CMS is mounted, the cables need to be connected. This section details the procedures for connecting the terminated cable-ends to the local equipment and faceplates as necessary.

The connections that can be made on the CMS are detailed for each component of the system in turn.

The connections to the Computer Module and Plug-In Module Rack are made using fully terminated cables from either other equipment or from Faceboxes/ Faceplates

To Connect the Computer Module and Plug-in Module Rack

The following figure shows all the possible connections to a Computer Module and the Plug-in Module Rack. The rack has an input on the left (female 20-way LNL) and an output on the right (male 20-way LNL).

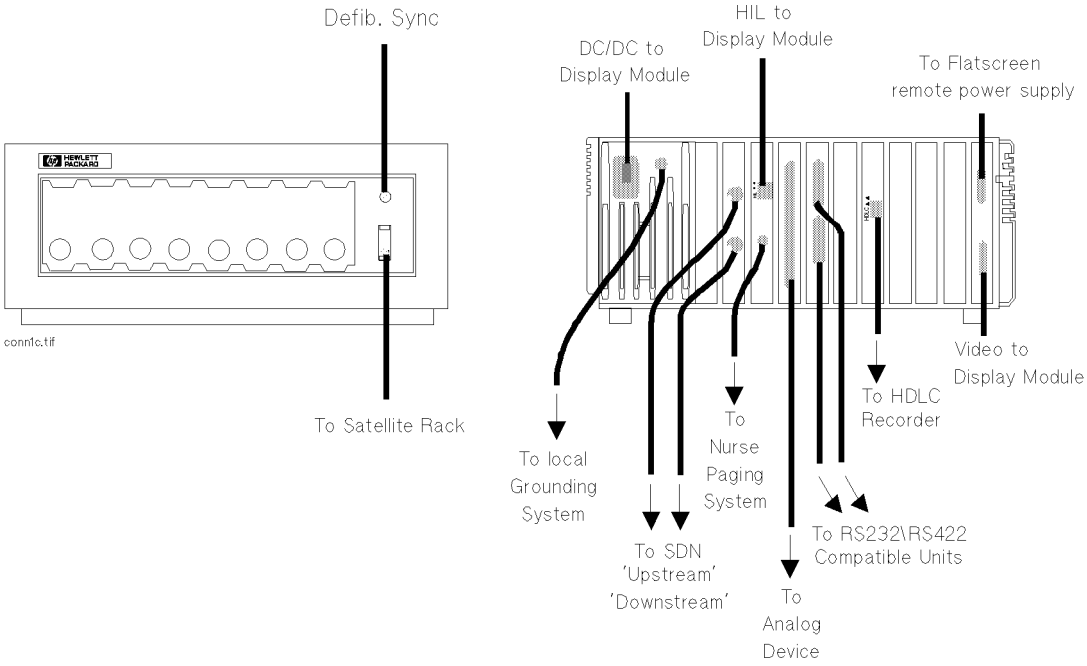


Figure 1-15 Computer Module and Rack Cable Connections

NOTES

1. When the Computer Module and CRT Display Module are stacked together, only the ground cable from the Display Module needs to be connected to the local grounding system.

2. The M1046B Computer Module allows access only to the Defib. Sync on the front cover. The Satellite Rack is connected to the connector on the metal cover and a mains power cable is connected to the integral power supply behind the plastic cover.

3. The M1046B Computer Module has standoffs for the feet and locking cam to allow space to route the Satellite Rack and power cables under the Computer Module to the rear. See page 1-35.

The connections to the Master Display Module are made using fully terminated cables from either other equipment or from Faceplates/ Faceboxes.

To Connect the CRT Display to the Computer Module

The following figure shows all the possible connections to the M1092A, M1094A, and M1094B 14-inch Display Modules.

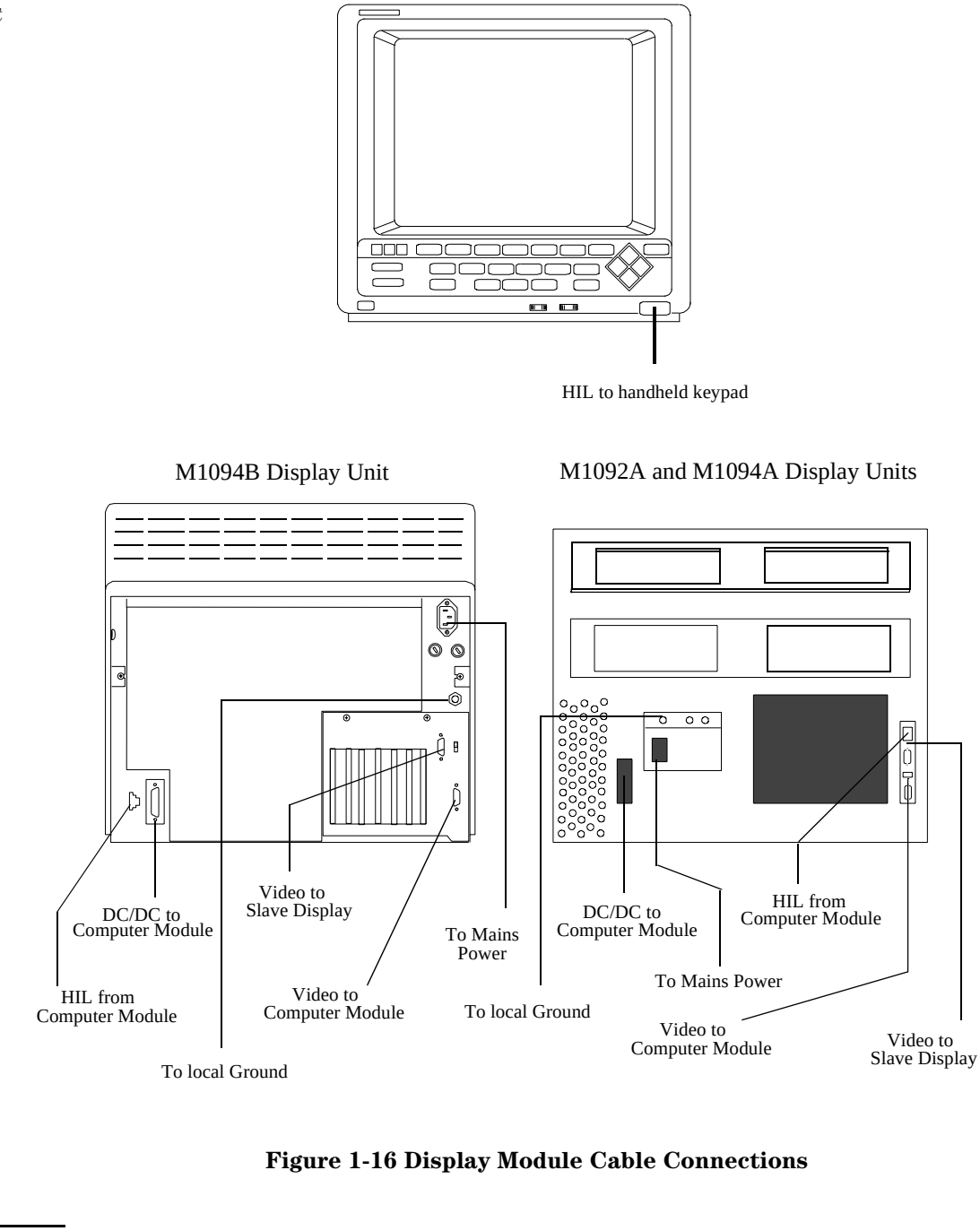


Figure 1-16 Display Module Cable Connections

NOTE When a 14" Display is used as a slave, the connections for DC/DC and Philips-HIL are NOT used.

To Connect the Flatscreen Display to the Computer Module

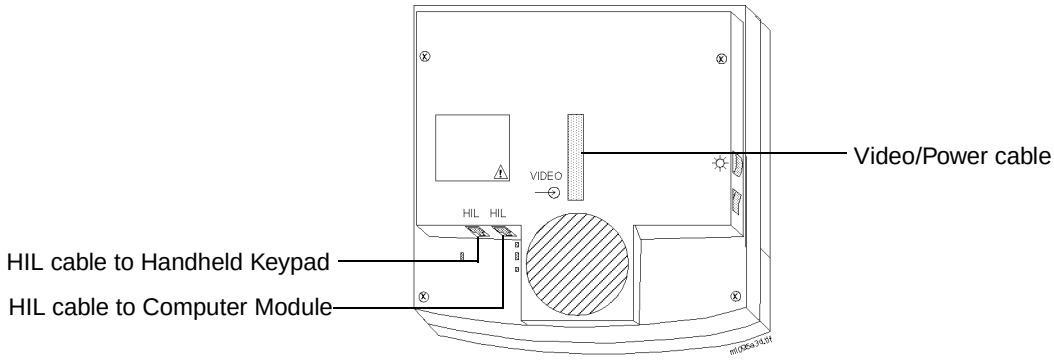


Figure 1-17 Flatscreen Display Module Cable Connections

The head of the 10m video cable is shrink-wrapped to facilitate passing through a narrow conduit. To connect the video cable, remove the shrink-wrap and assemble the two halves of the housing around the cable head, taking care to ensure that the cable hangs downwards.

To Connect the XGA-Compatible Display to the Computer Module

Connect the video cable of the display to the Video Out Connector of the Computer Module.

To Connect the Satellite Rack

Connect the male end of the cable to either the Computer Module or the Rack Output connector on another Satellite Rack and connect the female end of the cable to the Rack Input connector on this Satellite Rack.

To Connect the Strip Recorder

The connection to the strip recorder is made using a fully terminated cable connected to either a faceplate or directly to the HDLC Interface card on the rear of the Computer Module.

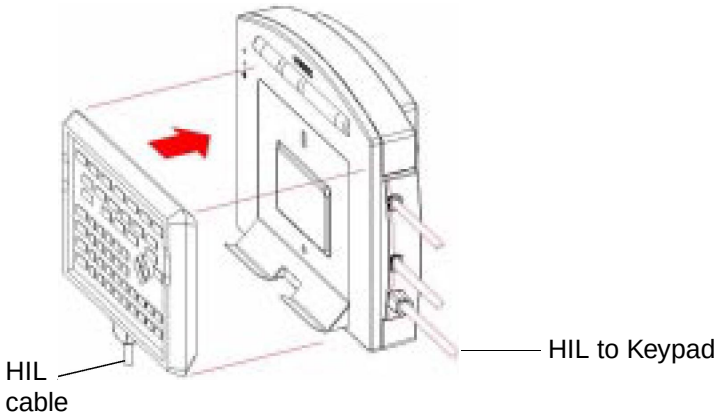
The handheld keypad can only be used with a Master Display Module.

To Connect the Handheld Keypad to the CRT Display Module

Remove the small plastic insert on the Master Display Module (to the front right of the brightness and contrast controls). This exposes the Philips-HIL connector.

Insert the handheld keypad connector (with prongs down) into the Philips-HIL connector on the Master Display Module. This is located in the lower front right-hand corner. The connector clicks into place.

To Connect the Handheld Keypad to the External Alarm Device



Connect the HIL connector of the Keypad to the corresponding connector of the External Alarm Device.

NOTE To connect any of the three cables to the External Alarm Device, you must first remove the connector cover. When the cables are plugged in, replace the cover.

To Connect the External Alarm Device to the Computer Module

Connect the Alarm Device's Philips-HIL connector to the Philips-HIL connector of the Computer Module using the HIL cable provided. Connect the Alarm Device's On/Off Switch connector to the On/Off Switch connector of the Computer Module using the remote switch cable provided.

To Connect Printers and PCs

Consult the central station service manual for a list of printers which can be used at the central station.

The CMS can print reports locally or at the central station. The printers must support Philips PCL Layer 3 Printer Commands. Local printers are connected to the RS-232 card in the rear of the Computer Module. Printers without serial port require a serial-to-parallel converter (Philips Part Number 5962-4340). This applies, for example, to the HP DeskJet 695C and the HP LaserJet 6P. Note that laser printers must contain at least 2 MB of RAM in order to be used with the CMS.

NOTE Printers must only be connected to the Computer Module using the cable options (for example, a 1.5m cable option M1181A #A50): all M1181A #A5** option numbers are for RS232/422 cables.

For detailed information on how to configure local printers, please refer to "Local Jet Printer Configurations" on page 3-37.

Connecting External Computer Systems

An external personal computer can be connected to the CMS via the RS232 connector (port 1): this option (#J13) is the Medical Computer Interface capability. If a second RS232 card is supported in your monitor, the PC can then be connected through the RS232 connector (port 3). Refer to the RS232 Computer Interface Programming Guide for a comprehensive description of the option's capabilities.

With Option #J13, the following parameter module data can be accessed:
All wave, numeric and alarm data.
All external device data interfaced by the CMS through VueLink.

NOTE Personal Computer Systems must only be connected to the RS232 connector on the Computer Module using the cable options (for example, a 1.5m cable option M1181A #A50).

Configuring and Adjusting Displays

Introduction

When a new display is connected to the CMS, it needs to be adjusted so that all information is visible. If you are connecting a standard XGA display, please refer to the section entitled "XGA Display Adjustments" on page 1-46.

When a new touchscreen display is connected to the CMS, it needs to be configured and calibrated. After the display has been configured and calibrated, a functionality test must be performed. This procedure comprises of:

- RS-232 port configuration.
- Check and fine tuning of screen adjustment.
- Touch screen configuration and calibration.

If you are connecting a standard touchscreen display, please follow the instructions in

Configuring the RS-232 Port

To configure an appropriate RS-232 port for the Touch Screen

Step 1 Switch to Configuration Mode and press:

Monitor Setup → **RS232** → **Touch**

The following table shows the supported RS-232 configuration settings of one card:

Table 1-20 RS-232 Configuration Settings

Upper Port	Lower Port	Upper Port	Lower Port
Computer Off	Computer On	Touch	Computer On
	Touch		Computer Off
	Mouse		Mouse
	AGM		AGM
	VENT		VENT
AGM	Computer Off	VENT	Computer Off
	Touch		Touch
	Mouse		Mouse
	VENT		AGM

Step 2 Restart the CMS.

The RS-232 interface is now configured for *Touch* operation and the new **Touch Setup** softkey is available from the Monitor Setup window when in Configuration Mode.

NOTE Once Touch or Mouse configurations are made, the CMS Monitor must be restarted in order to activate the new configuration settings.

NOTE Multiple AGM, VENT, Touch or Mouse configurations are not supported.

XGA Display Adjustments

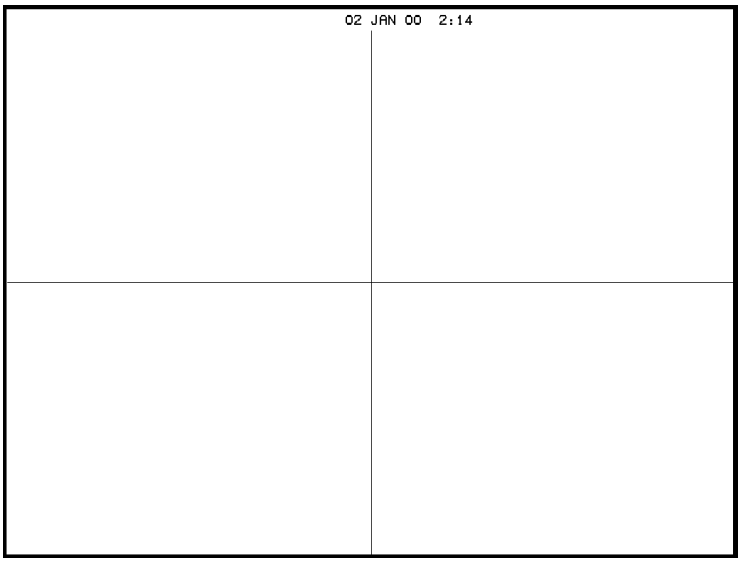
When setting up the M1097A XGA color flatscreen display, make sure that the whole image (all pixels) is visible on the display.

To test this and to make any adjustments:

Step 1 Go to Service Mode by pressing Monitor Setup followed by **Operating Modes**.

Step 2 Enter the password and select **Service**, then press **Confirm**.

Step 3 When the main screen is displayed, press the fourth (middle) function key on the keypad.



You should see lines on the display, showing a cross right through the middle of the screen and a frame bordering the whole screen.

Step 4 If you do not see the whole frame, adjust the display accordingly.

NOTE If you are adjusting a touchscreen monitor, please do a new calibration to make sure that the screen responds in the expected way.

Calibrating the Touch Screen

Once the RS-232 interface is configured for *Touch* operation, the CMS is able to communicate with the touch screen. If there is a communication problem between the CMS and the touch screen, the following message will be displayed:

Touch Operation Not Available - Check Setup

If communication is possible but the touch screen has not been calibrated, the following message will be displayed:

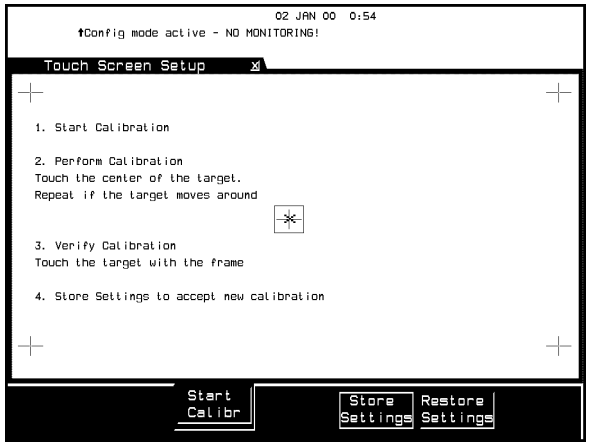
Touch Operation Not Calibrated - Check Setup

To calibrate the touch screen:

Step 1 Switch to Configuration Mode and press:

Monitor Setup → **Touch Setup**

The **Touch Screen Setup** window is displayed with a list of the step to be followed.


02 JAN 00 0:54
†Config mode active - NO MONITORING!
Touch Screen Setup
1. Start Calibration
2. Perform Calibration
Touch the center of the target.
Repeat if the target moves around
3. Verify Calibration
Touch the target with the frame
4. Store Settings to accept new calibration
Start Calibr
Store Settings
Restore Settings

Step 2 Press the **Start Calibr** key on the touch screen to start calibration of the touch screen.

Step 3 Tap the active (bright) cross sign target. Each target will in turn become active. Repeat the selection of each active target until all 5 targets have been selected. Calibration will now be carried out internally.

Step 4 If calibration is successful, the following message is displayed:

Calibration completed, press <store settings>

Step 5 Press the **Store Settings** softkey.

Performing the Functionality Test

After successfully calibrating the touch screen, complete the following test to check that the performance of the touch screen is correct:

Step 1 Switch to Monitoring Mode. Icons for **Silence/Reset**, **Suspend** and **Control** should be seen on the screen.

Step 2 Touch the **Suspend** button repeatedly. The alarms should switch between **Alarms Switched ON** and **Alarms Suspended**.

Step 3 Touch the **Control Panel** button. The **Control Panel** task window should be displayed.

Step 4 In the **Control Panel** task window, repeatedly touch the **Suspend Alarms** softkey. The alarms should switch between **Alarms Switched ON** and **Alarms Suspended**.

Step 5 Touch outside the **Control Panel** task window should close the task window.

Step 6 Touch any location on the screen.

Step 7 Check to see that a sign (+ or x) is displayed at the location that was touched.

Step 8 Repeat calibration if the confirmation sign is not acceptably close to the location that was touched and test again.

Configuring the Mouse or Trackball

Introduction

When a new mouse or trackball is connected to the CMS, the RS-232 port it is connected to, needs to be appropriately configured. After the RS-232 interface has been configured the mouse or trackball is operational. However, the response speed of the mouse or trackball can be adjusted.

Configuring the RS-232 Port

To configure an appropriate RS-232 port for the mouse or trackball

Step 1 Switch to Configuration Mode and press:

Monitor Setup → **RS232** → **Mouse**

Table 1-20 RS-232 Configuration Settings on page 1-45 shows the supported RS-232 configuration settings of one card:

Step 2 Restart the CMS.

The RS-232 interface is now configured for *Mouse* operation and the new **Mouse Setup** softkey is available from the Monitor Setup window when in Configuration Mode. Once Touch or Mouse configurations are made, the CMS Monitor must be restarted in order to activate the new configuration settings.

NOTE Multiple AGM, VENT, Touch or Mouse configurations are not supported.

Performing the Functionality Test

After connecting a mouse or trackball, complete the following test to check that the performance of the mouse or trackball is correct:

Step 1 Switch to Monitoring Mode.

Icons for **Silence/Reset**, **Suspend** and **Control** should be seen on the screen.

A cursor sign (+ or x) is displayed and should move when the mouse/trackball is moved.

A black or white border should be visible on or around any accessible target.

Step 2 Click the **Suspend** button repeatedly. The alarms should switch between **Alarms Switched ON** and **Alarms Suspended**. There should also be a "click" sound when clicking into this field.

Step 3 Click the **Control Panel** button. The **Control Panel** task window should be displayed.

Step 4 In the **Control Panel** task window, repeatedly click the **Suspend Alarms** softkey. The alarms should switch between **Alarms Switched ON** and **Alarms Suspended**.

Step 5 Click outside the **Control Panel** task window should close the task window.

Step 6 Move the cursor to any location on the screen. The cursor sign should change shape (+ or x) depending on whether or not it is placed over an active target.

Adjusting the Pointer Speed of the Mouse or Trackball (Optional)

Once the RS-232 interface is configured for *Mouse* operation, the CMS is able to communicate with the mouse or trackball and normal operation is possible. The pointer speed of the mouse or trackball can however be adjusted if desired.

To adjust the response of the mouse or trackball:

Step 1 Switch to Configuration Mode and press:

Monitor Setup → **Mouse Setup**

The **Mouse Setup** window is displayed with a list of the step to be followed.

Step 2 Adjust the speed of the mouse by use of the **Select Speed** up and down arrows.

Step 3 Press the **Store Settings** softkey.

Integral Power Supply - Computer Module (M1046B)

The M1046B Computer Modules use a flatscreen M1095A or XGA display as the main display. The power supply previously located in the Remote Power Supply is replaced by an Integral Power Supply located in this Computer Module (M1046B).

Note: Daisy-chaining is not permitted with the M1046B Computer Module.

Integral Power Supply - Connectors and Controls

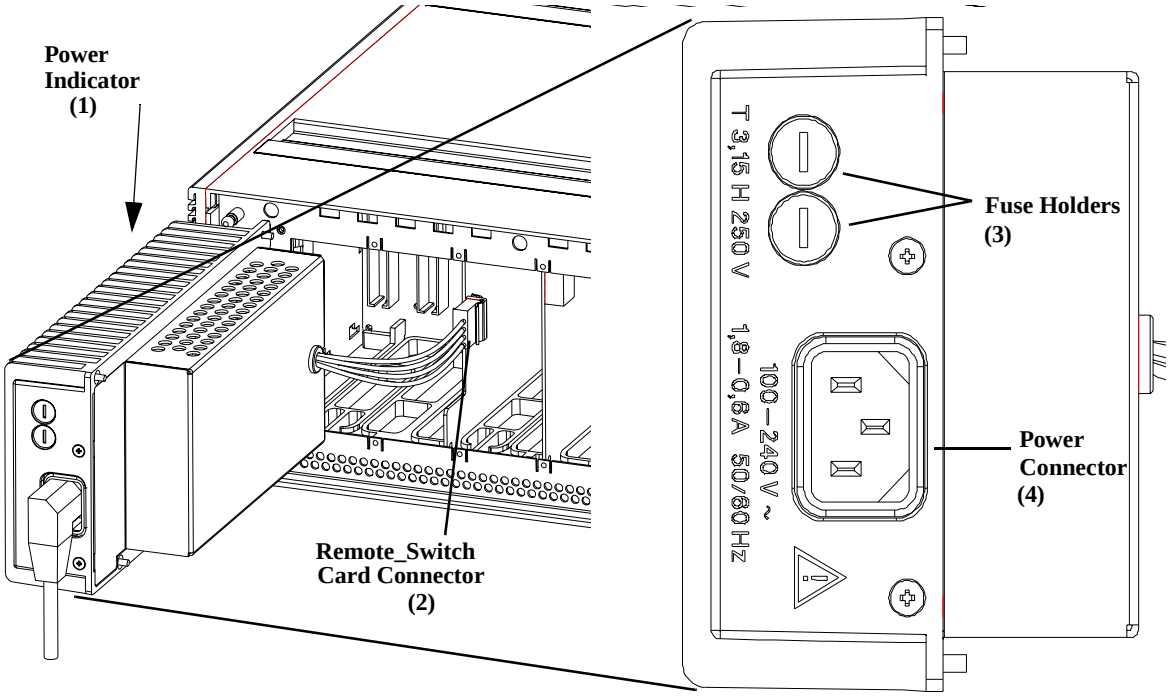


Figure 1-18 Integral Power Supply Connectors and Controls

Table 1-21 Integral Power Supply Controls and Connectors

	Controls and Connectors	Function
1	LED mains power indicator	This indicates that the Integral Power Supply is connected to the local power.
2	REMOTE_SWITCH card connector	This is a cable-end connector, used to connect the Integral Power Supply to the REMOTE_SWITCH card in the Computer Module.
3	Fuse Holders	Two fuse holders for the line protection fuses. (2 x 3.15 A H)
4	Local Power Connector	This is a 3-pin connector, used to input the local line voltage.

Remote Power Supply

The CMS can use the flatscreen M1095A as the main display instead of a CRT display and the M1046A Computer Module. For older CMS models (prior to the introduction of the M1046B Module), the power supply located in the main CRT display is replaced by a Remote Power Supply.

Front Panel Controls - Remote Power Supply

The controls on the front panel of the Remote Power Supply are shown below:

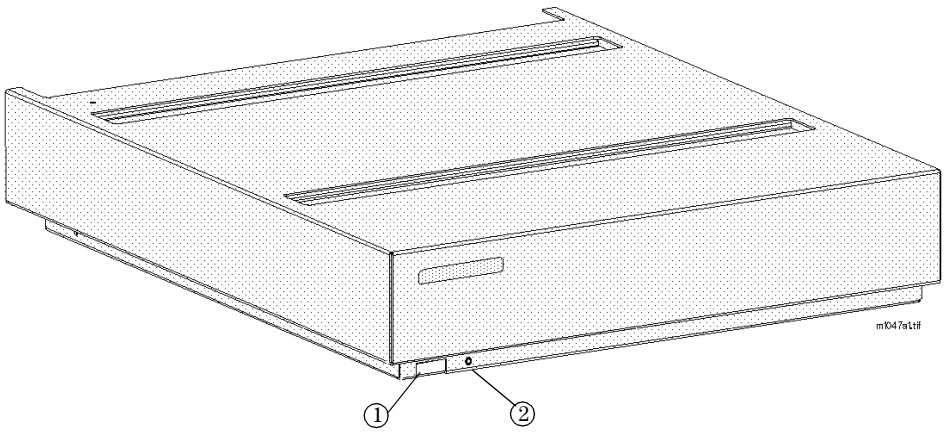


Figure 1-19 Remote Power Supply Front Panel

Table 1-22 Remote Power Supply Controls and Connectors

	Controls	Function
1	ON/OFF Switch	Used to turn the Remote Power Supply ON/OFF.
2	Power ON indicator	Green LED which is lit when the power supply is switched ON.

Remote Power Supply - Rear Controls and Connectors

The controls on the rear panel of the Remote Power Supply are shown below:

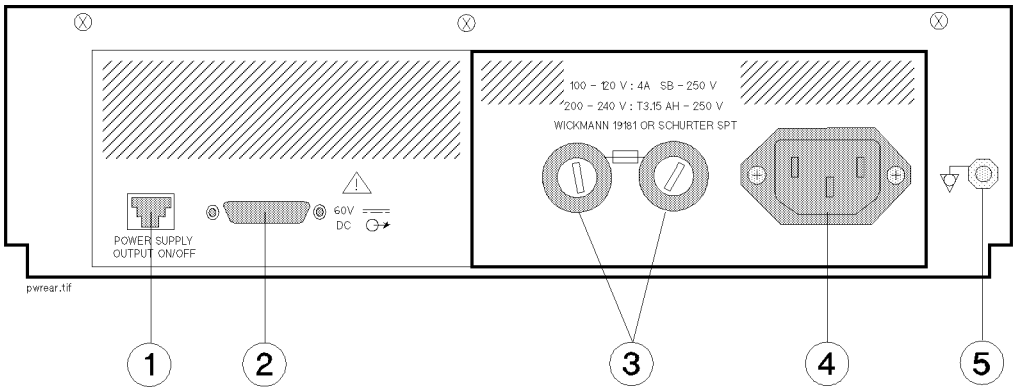


Figure 1-20 Remote Power Supply Rear Panel

Table 1-23 Remote Power Supply Rear Panel Controls and Connectors

	Controls and Connectors	Function
1	Remote ON/OFF Input	This cable connects the Power Supply to the video interface board (located in the CMS Computer Module). It is a female “modular jack” connector with 6-pins, used to input the power supply output ON/OFF signal from the Flatscreen Display.
2	60 V DC (120W max) Output	This is a female 15-pin Sub-D-Type connector, used to output the 60 V dc line voltage to the Computer Module.
3	Fuse Holders	Two fuse holders for the line protection fuses.
4	Local Power Connector	This is a 3-pin connector, used to input the local line voltage.
5	Equipotential Grounding Terminal	This is a grounding stud connector, used to connect the system to an equipotential grounding system.

Fuse Values

All CRT Display Modules, main and slave, remote power supply and the integral power supply, contain system fuses. The fuse values for each are recorded on a label near the fuse holders. The following table gives the fuse values for the CRT Display Modules, the Remote Power Supply, and the integral power supply located in the M1046B Computer Module and refers you to the page number that contains an illustration showing the fuse positions.

Table 1-24 CMS Fuses

CRT Display Type / Power Supply Type	Line Voltage 100-120 V		Line Voltage 200-240 V			Page Location
	Fuse Rating	Part Number	Fuse Rating	Part Number		
				VDE	UL	
M1092A Mono CRT Display (Main / Slave)	2 x T4.0 A	2110-0365	2 x T2.0 A	24220862 5096FMI	24220860 1266FMI	1-12 / 1-15
M1094A Color CRT Display (Main / Slave)	2 x T4.0 A	2110-0365	2 x T2.5 A	24220861 0219FMI	24220861 0009FMI	1-12 / 1-15
M1094B Color CRT Display (Main / Slave)	2 x T4.0 A	2110-0365	2 x T3.15 A H	242208610239FMI		1-12 / 1-15
M1047A Remote Power Supply	2 x T4.0 A	2110-0365	2 x T3.15 A H	242208610239FMI		1-53
M1046B Integral Power Supply	2 x T3.15 A H	2110-1025	2 x T3.15 A H	242208610239FMI		1-51

Plug-in Module Racks

The Plug-in Module Rack of the CMS is the interface between the Plug-in Modules and the Computer Module. The racks can be either *integral*, located in the M1046A Computer Module or *satellite*, located in the patient vicinity connected by a cable to the rack interface of the Computer Module (M1046A or M1046B). Satellite Racks can also be daisy-chained, depending on how many modules your system can support. Three plug-in module racks are currently supported by the monitor: 8-slot integral rack, M1043A, 8-slot Satellite Rack M1041A and 6-slot rack of the Philips Component Transport System, M1276A.

A blank rack is also available for the M1046A Computer Module. The blank rack is used if you do not require plug-in modules to be placed close to the Computer Module. The blank rack acts as the connection between the Satellite Rack and the Computer Module.

Objective

In order to meet this section's goals, you should be able to:

• Identify the connectors of the plug-in module racks.

• Be familiar with the function of the plug-in module racks.

Concepts

The plug-in module racks of CMS are not fitted with any controls, just connectors. The function of the rack is to connect the plug-in modules to the Computer Module. A standard CMS integral rack contains eight slots for plug-in modules. Modules can be single-width modules or double-width modules so the number per rack depends on which plug-in modules are being used. To accommodate more modules, you can daisy-chain Satellite Racks to the rack in the Computer Module. The number of monitoring slots supported depends on the model of your monitor.

Integral Rack The integral rack is a plastic rack that sits in the front of the M1046A Computer Module and connects the plug-in modules to the system. It contains a rack interface connector, a defibrillator connector, module connectors and a rear internal rack connector.

Satellite Rack The Satellite Rack is a plastic rack that is remote to the Computer Module and connects plug-in modules to the system. It connects by a cable to a rack interface connector to route the data between the plug-in modules and the Computer Module. It contains input and output rack interface connectors and module connectors, but it does not have a defibrillator connector.

Blank Rack The blank rack is a plastic rack that sits in the front of the M1046A Computer Module and provides connections for a defibrillator and

Satellite Racks to the system. It is used if you do not require plug-in modules to be placed close to the M1046A Computer Module.

Front and Rear Connectors

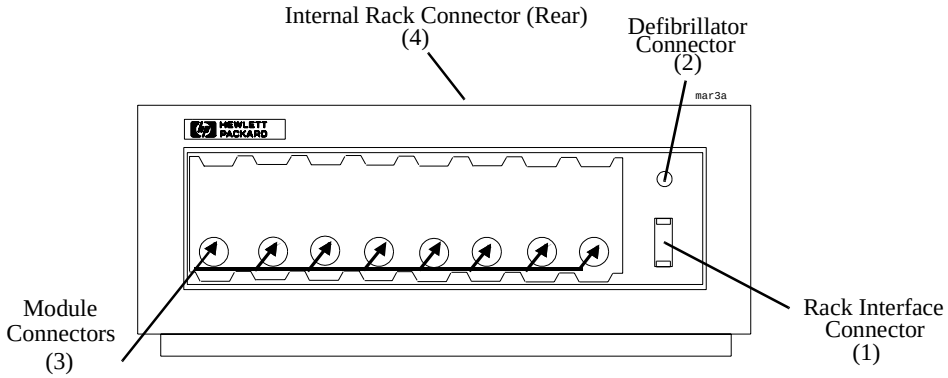


Figure 1-21 Integral Plug-in Module Rack M1043A

Table 1-25 Plug-in Module Rack Connectors

	Connector	Function
1	Rack Interface Connector	Female interface connector, used to daisy-chain Satellite Racks.
2	Defibrillator Connector	0.25" phone socket, used to output an ECG wave to synchronize a defibrillator and provide an input for the defibrillator marker signal. It is also used as an output of ECG waveforms during the specification tests. See Parts List for ECG-Sync Cables.
3	Module Connectors	Female plug-in module connectors, used to input the information from the plug-in modules to the integral rack.
4	Internal Rack Connector	Rack Interface connector (located on rear of the integral rack or blank rack), used to output the information from the rack to the Rack Interface function card placed in slot 18 of the Computer Module.

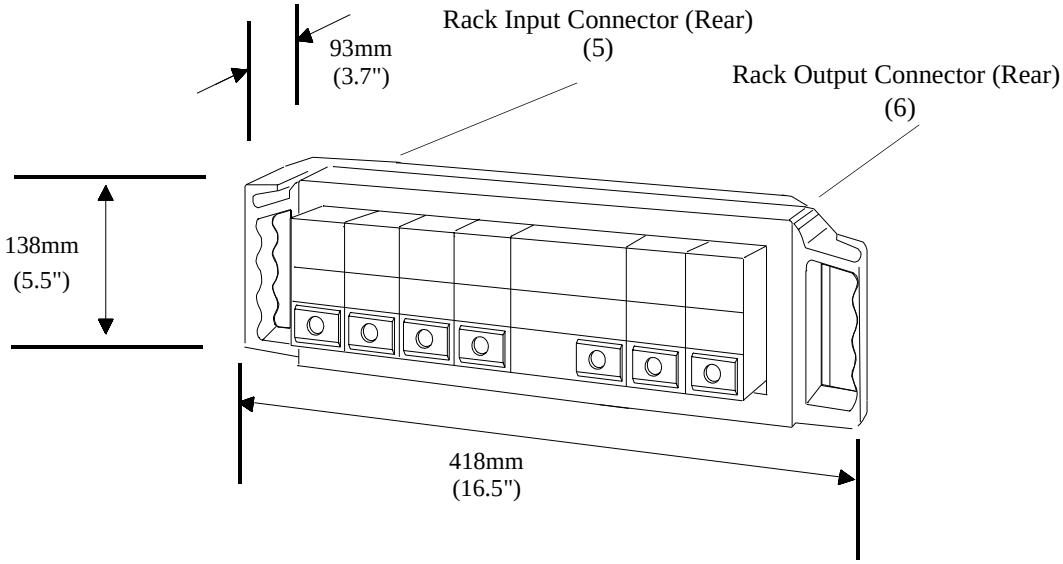


Figure 1-22 Satellite Plug-in Module Rack M1041A with Parameter Modules

Table 1-26 Plug-in Module Rack Connectors

	Connector	Function
5	Rack Input Connector	Male Rack Interface Connector, used to connect the Satellite Rack to the Computer Module or to the previous rack in the chain.
6	Rack Output Connector	Female Rack Interface Connector, used to connect the Satellite Rack to the next rack in the chain.

Plug-in Modules

The plug-in parameter modules of the CMS can be thought of as the specialists of the monitor. Each module carries out a specific task and can be moved from one monitor to another, depending upon the functionality of the respective monitors. Plug-in modules are labeled with a symbol or the name of the measurement that they perform.

Objective

In order to meet this section's goals, you should be able to:

• Identify the controls found on the front of plug-in modules.

• Be familiar with the function of the controls of the plug-in modules.

• Identify the connectors found on the front and rear of plug-in modules.

Concepts

The plug-in modules of CMS have one or more hardkeys on the front panel. The hardkey labeled with the parameter name is the setup key, which lights up the setup indicator and gets you directly into the Task Window for that parameter.

The connector socket on the front of each module varies, but it is the same color as the corresponding connector plug on the transducer or patient cable for that module. The connector on the rear panel of each plug-in module is a male connector, used to supply power and allow communication from the module to the module rack.

Plug-in modules can be either single-width or double-width units. A single-width module will occupy one slot in a module rack while a double-width module will require two-slots. Therefore, you must consider the width of the plug-in modules and number of slots that you have available to determine how many modules you can use in a single monitor. See Appendix A Product Information for more module information.

Parameter	The parameter of the plug-in module is the specific clinical measurement performed by the module. Some modules, like the ECG/Resp module, are capable of monitoring more than one parameter.
Single-width Module	A module that occupies only one slot in the module rack.
Double-width Module	A module that occupies two slots in the module rack.

Plug-In Module Control Panel Keys and Indicators

The following drawings represent the types of controls, indicators and connectors found on the front panels of the plug-in modules. The controls, indicators and connections are described in the following table.

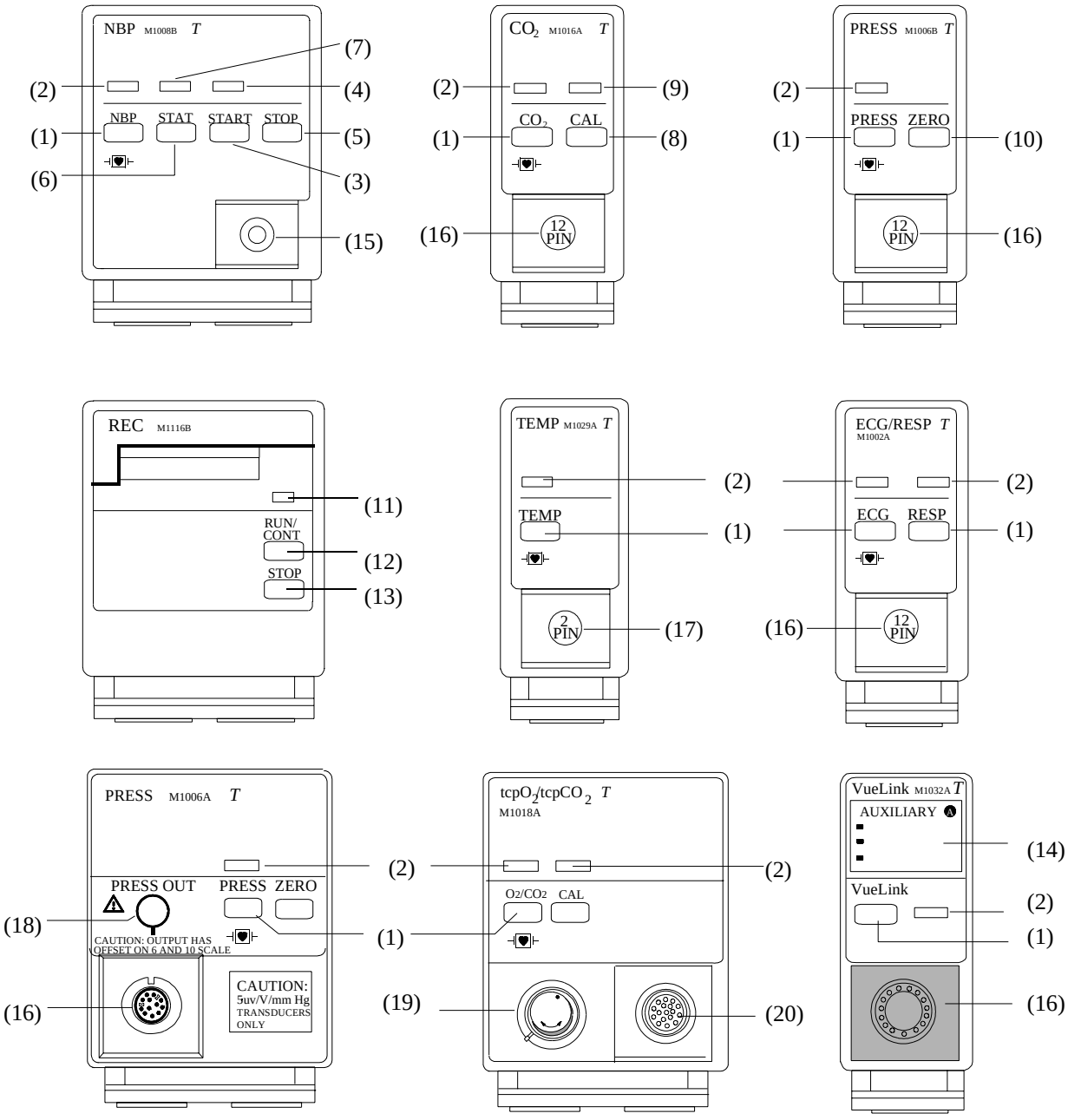


Figure 1-23 Examples of the Plug-in Module Front Panels

Table 1-27 Plug-in Module Controls and Connectors

	General Controls	Function
1	Setup Key	Used to enter the module setup screen or Task Window.
2	Setup Indicator	Green LED lit when in the module setup screen.
3	Start Key	Used to start a measurement cycle.
4	Start Indicator	Green LED which will be lit when the measurement cycle is entered.
5	Stop Key	Used to stop the measurement cycle.
6	Stat Key	Used to start a Static measurement cycle.
7	Stat Indicator	Green LED lit when the static measurement cycle is entered.
8	CAL Key	Used to enter the module's calibration screen and initiate module calibration procedures.
9	CAL Indicator	Green LED lit during a module calibration procedure.
10	Zero Key	Used to zero a transducer without using the main display controls.
11	Continue LED	Lights if the current recording is continuous. The LED also blinks twice when the module is first plugged in. This indicates that the recorder self-test has been completed successfully.
12	RUN/CONT Key	Used to start a Mode A continuous real-time recording, if the recorder is not running. If the recorder is running, it makes the current recording continuous (if possible).
13	STOP Key	Stops the current recording.
14	Labels	Labels giving names of the external devices to which the VueLink module can be connected and an LED beside each label, indicating the selected device.
15	NBP Connector	Standard NBP connector for connection to the cuff.
16	12-pin Connector	Standard 12-pin connector for use with Transducers. Refer to the tables on page 1-63.
17	2-pin Connector	Standard 2-pin connector for use with standard series temperature probes.
18	Analog Output Jack	Standard 1/4 inch phone jack used to provide analog signals to an intra-aortic balloon pump on the M1006A Option #C01. The M1006B Option #C01 has 3.5mm phone jack socket, supplied with adapter for those customers who have been using a 6.3mm (1/4 inch) phone jack.
19	Calibration Chamber	Calibration chamber, with gas inlet for $tcpO_2$/$tcpCO_2$ module.
20	20-pin Connector	20-pin connector for use with a $tcpO_2$/$tcpCO_2$ transducer.

The following is the front panel of the SideStream CO_2 module.

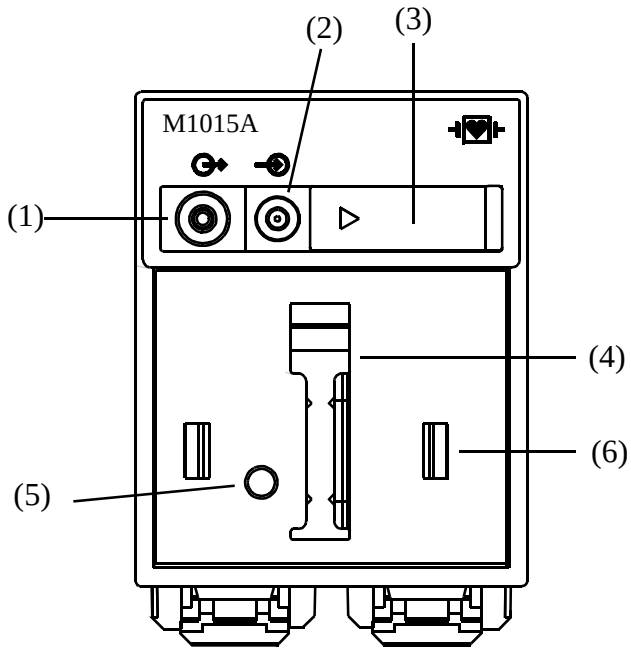


Figure 1-24 Sidestream CO_2 Module Controls and Connectors

Table 1-28 Sidestream CO_2 Module

	Connector	Function
1	Gas Outlet Connector	Lets out the gas after it has been sampled.
2	Gas Inlet Connector	Provides the connection for the sample tubing (and bacterial filter) which receives the patient's gas sample.
3	Slide Cover	Protects the gas inlet connector when the module is not in use.
4	Sample Cell	The CO_2 transducer is mounted on the sample cell of the sidestream module. The transducer plug is connected to the M1016A CO_2 Plug-in Module.
5	Switch	Activates the sidestream pump when the CO_2 transducer is mounted on the sample cell.
6	Mounting Clamp	Holds the CO_2 transducer in place.

The following are the front and rear panels of the Blood Analysis Module:

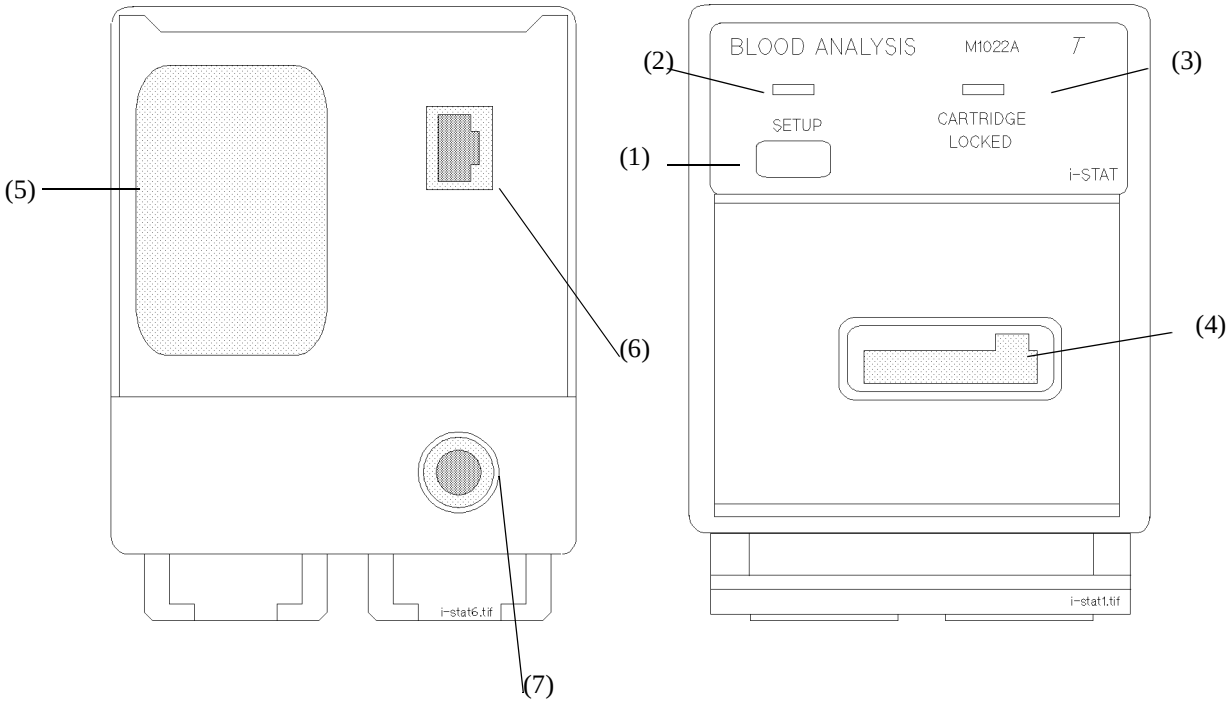


Figure 1-25 Blood Analysis Module

Table 1-29 Blood Analysis Module Controls and Connectors

	Control/Connector	Function
1	Setup Key	Used to enter the Blood Analysis Setup or Results screen.
2	Setup Indicator	Green LED lit when in Blood Analysis screens.
3	Cartridge Locked Indicator	Green LED blinks when a cartridge is being processed; the cartridge must be left in the slot until the blinking stops and the light is off.
4	Cartridge Insertion Slot	The cartridge is inserted here for processing.
5	Identification Label	Contains product serial number and identification details.
6	Software Update Link Connector	For connecting to the Central Data Station (or other PC) to perform software upgrades. During the upgrade process, the module is powered via this link.
7	Parameter Module Connector	Connects the module to the rack.

Plug-in Module Pin-outs

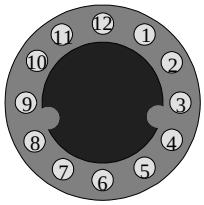
There are several types of connectors found on the front of the plug-in modules. The following tables give the pin-out information for the plug-in modules that contain front panel connectors.

Table 1-30 Parameter Module Connector Signals

Pin #	Parameter Module							
	ECG M1001A/B	**ECG/Resp M1002A/B**	**Pressure M1006A/B**	**C.O. M1012A**	**CO_2 M1016A**	**FIO_2 M1017A**	**SpO_2/Pleth M1020A**	**EEG M1027A**
1	right arm	right arm + resp	Shield (M1006B)	-	detector signal	-	signal (photocurrent)	EEG1–
2	right leg	right leg	-	GND	detector bias	-	GND + shield	REF
3	-	-	-	injectate temp	heater return	-	resistor code 1	-
4	-	-	-	GND	drive coil	-	LED com	-
5	chest	chest	jumper to 8	blood temp	sense coil	-	resistor code 2	EEG1+
6	left leg	left leg + resp	-	code resistor	GND	-	LED com	EEG2–
7	left arm	left arm	-	GND	IR-source	-	LED 12	EEG2+
8	-	-	jumper to 5	-	heater power	-	LED 34	-
A	-	-	– excitation	start key (to C)	GND	feedback resistor	GND	-
B	-	-	+ input	-	GND	input current	-	-
C	shield	shield	+ excitation	start key	temp. sense high	polarization voltage	-	shield
D	-	-	± input	-	temp. sense low	-	-	shorted to C

Table 1-31 More Parameter Module Connector Signals

Pin Number	Parameter Module		
	$tcpO_2/CO_2$ M1018A	**VueLink M1032A**	**$Sv0_2$ M1021A** Connector signals to and from the Abbott Optical Module (50131-04)
1	GND	Analog 1	n.a.
2	Temp Sensor 1 (NTC1)	Analog 2	Analog RXD
3	Temp Sensor 1 (NTC2)	Analog 3-Ring Indicator	Analog GND
4	GND	Analog 4-Data carrier Detected	n.a.
5	+5V (transducer supply voltage)	Analog 5-Data Send Ready	n.a.
6	- 9V (transducer supply voltage)	Analog 6-Data Terminal Ready	+ 12V (heater regulator antinodal signal Amp. supply voltage)
7	Polarization voltage	Analog 7-Clear to Send	- 9V (Analog Signal Amp.supply voltage)
8	O_2 Input	Analog 8-Read to Send	n.a
9	GND	Digital ground	n.a.
10	Transducer Code (not used)	Transmit Data	+ 5V (Serial Comm. and EEPROM supply voltage)
11	Heater current return	Receive Data	- 12 V (heater supply voltage)
12	Heater current send	Analog ground	SER GND (Power supply ground for Serial Comm. and EEPROM)
13	CO_2 Input	n.a.	Chip-Select-Signal EEPROM
14	Temp 2 Input	n.a.	Clock Signal EEPROM
15	-	n.a.	Serial Data In/Out (bi-directional)
16	Transducer Code (O_2)	n.a.	Current Diode A
17	GND	n.a.	Current Diode B
18	Transducer Code (CO_2)	n.a.	Current Diode C
19	-	n.a.	LED GND (ground for LED current lines)
20	-	n.a.	-



Pin numbers (frontal) of the VueLink connector

Operating Modes

There are four operating modes for the CMS: Monitoring, Service, Demo, and Configuration Mode. The only mode that supports monitoring is the Monitoring Mode. All modes are entered through passwords to prevent unintentional mode changes. From Rel. C.0 returning to monitoring mode is allowed without entering a password.

Objective

In order to meet this section's goals, you should be able to:

- Identify the monitoring modes of CMS.
- Be familiar with the function of the monitoring modes of CMS.

Concepts

The operating modes of CMS are designed for specific tasks.

- Monitoring Mode is the standard operating mode that supports patient monitoring.
- Service Mode is used to perform service functions.
- Demo Mode is used to demonstrate the functions of the system.
- Configuration Mode is used to modify the behavior of the system.

Monitoring Mode is the only mode that should be used on a monitor that is attached to a patient. To ensure that the operating mode is not changed by unauthorized personnel, passwords are required to change operating modes.

When you change the operating mode of the monitor, you reset the patient database and all temporary changes that you have made to the system. This is why the system will always display a warning message "Patient data cleared - Settings reset" and ask you to confirm the action before it changes operating modes.

Main Screen This screen shows the waveforms and numerical readouts of the parameters you have chosen to monitor: alarms, INOP messages, bed label, date and time, and arrhythmia messages (when assigned).

Selection Window The Selection Window is the first operating level where you can choose a specific activity or function. It is entered through a hardkey on the Control Panel or the Handheld Keypad.

Task Window The Task Window is the second operating level which allows you to make changes or adjustments to the parameters and screen displays, or to perform procedures. It is entered through a softkey in the Selection Window or directly through the Control Panel of the plug-in module.

Status Message The status message is a string of text displayed in the top center of the screen below the date and time. A message is displayed in status line to indicate the current operating mode if not Monitoring.

Operating Rules to Remember

- Pressing the Main Screen or Standard Display hardkey always returns you to the main screen.
- To get into a Selection Window press a hardkey.
- Active softkeys are highlighted and/or look like "pushed-in" buttons (3-D effect).
- Softkeys only function in the Selection and Task Windows.
- The parameter module setup key gets you directly into a Task Window.
- The arrow keys and Confirm key are always illuminated when available for use.
- If after pressing a setup key the LED is not lit, the system is busy and the setup screen cannot be entered. The setup key must be pressed again. If you continue to have problems see the troubleshooting chapter.
- When an operating mode is entered or left, all monitoring settings are reset to the user defaults and the database is cleared.

Identifying Monitoring Mode

Monitoring Mode is the standard mode and is used when the monitor is attached to a patient. No other mode should be used when a patient is connected to a monitor. In this mode you will have access to three types of screens: the Main Screen, the Selection Windows and Task Windows. Through these screens you can make temporary changes to customize the parameter settings and the monitor setup as well as perform all of the monitoring tasks of CMS.

When you are in monitoring mode, you will see active messages on the screen indicating the status of the patient and the monitor. INOP messages are displayed in the upper left-hand corner of the display and alarm message in the upper right. When the monitor is in any mode other than Monitoring Mode, you will find a text message in the status line that indicates the active mode.

The Demo Mode does not support patient monitoring and should never be active while a patient is attached to the monitor.

Identifying Demo Mode

Demo Mode is the mode used to demonstrate the monitoring functions of the system. It provides the user with sample waves and screens but it does not support monitoring and should not be used when a patient is attached to the monitor. All three levels of monitoring screens are available in Demo Mode: Main Screen, Selection Window and Task Window. Demo Mode demonstrates the modules that are currently plugged into the monitor so don't expect to see waves for modules that are not in the rack.

To clearly identify the Demo mode, a text message is displayed in the status prompt. The message reads “DEMO Mode Active - NO MONITORING”. If your monitor is running Release E or later, the message “DEMO” is displayed in inverse low-intensity white characters in the first wave channel underneath the status prompt line. This message is alternatively displayed to two lines of normal characters in the same inverse block telling the user “to exit: press CONFIRM”. To leave Demo Mode in systems running Release D or earlier, you must use the standard procedure of using a password to change the operating mode. Either way, leaving Demo Mode or any other mode causes the patient data to be cleared and the settings to be reset.

Identifying Configuration Mode

The Config Mode does not support patient monitoring and should never be active while a patient is attached to the monitor.

The Configuration Mode is the operating mode used to change the monitoring behavior and screen layout. This mode is used to customize the monitor to meet your hospital’s monitoring protocols. When you make changes in the Config Mode, you are creating permanent user settings to replace the standard factory settings that came with the monitor. A cold start or operating mode change will clear the patient data and reset any temporary changes you made in Monitoring Mode to the permanent user settings you made in Config Mode.

To clearly identify the Config Mode, a text message is displayed in the status prompt. The message reads “Config Mode Active - NO MONITORING”. No waveforms, INOPS or alarms are displayed in Config Mode. Like the other operating modes, you must input a password to enter and exit the Config Mode.

Identifying Service Mode

The Service Mode does not support patient monitoring and should never be active while a patient is attached to the monitor.

The service mode is the operating mode used by service personnel to access complete error message listings and perform service related tasks, like specification tests. The Service Mode is also used to troubleshoot the monitor.

To clearly identify the Service Mode, a text message is displayed in the status prompt. The message reads “Service Mode Active - NO MONITORING”. No waveforms, INOPS or alarms are displayed in Service Mode. Like the other operating modes, you must input a password to enter and exit the Service Mode.

Changing Operating Modes

Now that you know about the various operating modes of CMS, let's look at how to move between two operating modes. This requires operating mode-specific passwords. Mode-specific passwords guard against unauthorized changes to the monitor.

The operating modes of CMS can be changed using the following sequence of keys and passwords.

Note: From Rel. C.0, returning to monitoring mode is allowed without entering a password. Just press [Monitor Setup] followed by [Resume Monitor].

Table 1-32 Procedure to Change Operating Mode

Step	Action	Comment
1	Press [Monitor Setup] (or [Instrument Config])	The monitor setup or instrument configuration Selection Window is displayed.
2	Press More Choices if available	Shows additional choices for softkeys in this Selection Window.
3	Press Operating Modes softkey	The Operating Mode Task Window displays the current operating mode in words (for example, "Operating Mode - Monitoring") and prompts for the password.
4	Enter the password. Configuration Mode: 1245 Demo Mode: 14432[a] Service Mode: 4311 Master Password: 14432[a]	Use the keys labeled 1 to 5. If the password is correct, then the Change OpMode softkey is highlighted. If the password is incorrect, the system returns to the Standard Display.
5	Press Change OpMode softkey	The Operating Mode Task Window displays both Monitor and Config in reverse video, with the current operating mode highlighted.
6	Select the required Operating Mode.	Use the arrow keys or press the Change Opmode softkey.
7	Press [Confirm].	The system performs a cold-start and switches operating modes.

a. Note: Use of this password allows access to all operating modes

Chapter 2 Testing & Maintaining the CMS

The first section in this chapter describes the procedures required to ensure that the CMS is in safe working order. The following sections describe recommended procedures for maintaining the equipment. These procedures apply to all versions of the CMS. The procedures are grouped as follows:

Mandatory Periodic Maintenance and Safety Checks

- Performance and Safety Test requirements
- Preventive Maintenance Procedure for the CMS Wall Mount Assembly

Recommended Maintenance Procedures

- General Inspections of the System
- Cleaning and Disinfecting Procedures for the CMS

See “Procedure Overview” on page 2-2 for a more detailed overview.

Objectives

In order to meet the chapter’s goals, you should be able to:

- Perform required safety checks and maintenance procedures.
- Perform a general inspection of the system.
- Clean the major units of the CMS.

Concepts

The Philips CMS Patient Monitoring System has different levels of preventive maintenance and checks that should be performed on a periodic basis or as recommended.

If you wish to perform more detailed tests on the plug-in parameter modules, please see Chapter 4 “Troubleshooting the Plug-in Modules”.

The procedures described in this chapter should be performed at the specified time intervals to ensure effective preventive maintenance. The checklist may be photocopied, completed by the maintainer, and filed for reference.

Procedure Overview

Table 2-1 Mandatory Periodic Maintenance and Safety Checks

Procedure	Steps	Page
"Test and Inspection Requirements"	When to Perform Test Blocks Tests and Inspection Requirements Safety Tests Safety Test Diagrams	2-3 2-5 2-11 2-12
"Preventive Maintenance Procedure for the Philips M1180A #A01 and #A02 Wall Mount Assembly"	Step 1: Inspect visible fasteners Step 2: Check maximum tilt range Step 3: Inspect mounting plate for movement	2-15 2-17 2-17

Table 2-2 Recommended Maintenance Procedures

Procedure	Steps	Page
"General Inspections of the System"	Inspect the System Hardware Inspect the Cables Inspect the Red Power Indicators (LEDs) of the System Inspect the Display CRT / LCD Inspect the Controls of the System	2-19 2-20 2-20 2-21 2-22
"Cleaning and Disinfecting Procedures"	General Cleaning of the System General Disinfecting of the System Cleaning the Recorder Module Cleaning the Blood Analysis Module	2-24 2-25 2-26 2-27

Test and Inspection Requirements

NOTE **The Test and Inspections Procedures described in this section are mandatory requirements.**

This section is intended primarily for Philips customer engineers and lists the mandatory test requirements for CMS for servicing, installation and preventive maintenance. For some tests it is required that the Philips engineer documents the results in a service record.

Table 2-3 When to Perform Test Blocks explains when to perform the procedures. Table 2-4 Tests and Inspection Requirements explains the procedures to be performed. Table 2-5 CMS Test and Inspection Requirements – Safety and Table 2-6 Safety Test Diagrams give full details of the Safety Tests.

NOTE Note: Only Philips service engineers are required to report the results of the following safety and performance tests back to the factory. Of the performance tests, only those for NBP and Sidestream CO_2 need to be reported. .

Table 2-3 When to Perform Test Blocks

Service Event – When performing	Test Block(s) Required Complete these tests
Installation of CMS with Medical equipment connections (for example, AGM or Vuelink) but with NO System (SDN)	Perform Visual and Power On test blocks (see page 2-5).
Installation of CMS that is connected to a System (SDN)	Perform Visual and Power On test blocks. If the 78581A safety test (see the 78581A service manual) has passed previously no further safety tests are required. If the 78581A safety test has not been performed, it must be completed.

Table 2-3 When to Perform Test Blocks

Service Event – When performing	Test Block(s) Required Complete these tests		
Installation of CMS that has connections to non-medical devices (for example, XGA Display, Laser Printer or PC) **Note:** If a non-medical device requires the use of an isolation transformer in order to limit the enclosure leakage current to meet the requirements of IEC 601-1, the power cable connecting the non-medical device to the isolation transformer must be fixed. It must not be possible to remove the power cable without the use of appropriate tools. **Note:** If a non-medical device requires the use of additional protective earthing in order to limit the enclosure leakage current to meet the requirements of IEC 601-1, the earthing components must be securely fixed at both ends and must not be removable without the use of appropriate tools. **Note:** Interface cables over 3.om are not to be used.	**Device type and test required**	**Test results (where appropriate)**	**Action required**
	Device is **NOT** IEC 601-1, IEC 60950 or IEC 61010 compliant	Not applicable	Device **NOT** acceptable. **DO NOT USE**
	Device is IEC 601-1 compliant	No tests required	Device acceptable. No action required.
	Device is IEC 60950 or IEC 61010 compliant Class I Equipment (Protectively Earthed Equipment) Perform Visual and Power On test blocks (see page 5). Perform Safety (1) test block (see page 11).	Compliant with IEC 601-1 Enclosure Leakage Current limitations	Device acceptable. No action required.
		Normal condition is within the requirements of IEC 601-1 Single fault condition exceeds IEC 601-1 requirements	Additional Protective Earthing must be provided for non-medical device, and must not be removable without the use of a appropriate tools or Non-medical device must be connected to the mains supply via an Isolation Transformer
		Normal condition exceeds IEC 601-1 requirements	Non-medical device must be connected to the mains supply via an Isolation Transformer
	Device is IEC 60950 or IEC 61010 compliant Class II equipment (Double Insulated Equipment) Perform Visual and Power On test blocks (see page 11). Perform Safety (1) test block (see page 11).	Normal condition exceeds IEC 601-1 requirements	Non-medical device must be connected to the mains supply via an Isolation Transformer or Non-medical device must isolated from the medical device by use of a separation device
Repairs where the power supply in the M1094A/M1094B/M1092A/M1046B assembly is replaced	Perform Power On and Safety (2) test blocks (see page 2-11).		
Repairs where the monitor has been dropped	Perform Power On and Safety (2) and (3) test blocks (see page 2-12).		
All other CMS repairs, Hardware or Software Upgrades	Perform Power On test block.		

Table 2-3 When to Perform Test Blocks

Service Event – When performing	Test Block(s) Required Complete these tests
Preventive Maintenance[a]	Perform the NBP and Sidestream CO_2 Module Performance test blocks **every year** (see page 2-6). Perform the Preventive Maintenance Procedure for the M1180A #A01/ A02 Wall Mount Assembly **every year** (see page 2-15). If an AGM is present, refer to the AGM (M1026A) test matrix. For the BIS module no periodic preventive maintenance is required.
Performance Assurance and Safety Tests[b]	Perform all other Performance test blocks and all Safety test blocks (1), (2) and (3) once every two years.

a. For **Germany only**: For modules that do not have the CE mark, contact the Customer Response Center in Ratingen for information.

b. For the BIS module performance and safety testing is optional (Philips recommends yearly testing). However, safety testing (Safety test block (3)) is required if there is suspected liquid ingress or after every time the case of any of the BIS components has been opened.

Table 2-4 Tests and Inspection Requirements

Test Block Name	Test or "Inspection" to Perform	Expected Test Results	What to Record on Service Record
Visual Test	Inspect the system for obvious signs of damage. Also check external leads and accessories.	The system does not have any obvious signs of damage = Pass.	**V:P or V:F** where P = Pass and F = Fail
Visual Test for M1180A #A01/ A02	Step 1: Inspect visible fasteners Step 2: Check maximum tilt range Step 3: Inspect mounting plate for movement	Mounting is within Specs as described on page 2-15 and following.	**VM:P or VM:F** where P = Pass and F = Fail
Power On Test	<table><tr><th>Step</th><th>Step</th></tr><tr><td>1</td><td>Switch on the monitor.</td></tr><tr><td>2</td><td>Plug in an ECG Module.</td></tr><tr><td>3</td><td>Observe whether the monitor boots up successfully without displaying an error code and if an ECG wave appears on the display.</td></tr></table>	Monitor boots up. All Alarm LEDs light up shortly. From release B.0, the loudspeaker gives a series of test sounds. No error codes are displayed. An ECG wave is displayed.	**PO:P or PO:F** where P = Pass and F = Fail

Table 2-4 Tests and Inspection Requirements*(Continued)*

<table>
<tr><th>Test Block Name</th><th>Test or “Inspection” to Perform</th><th>Expected Test Results</th><th>What to Record on Service Record</th></tr>
<tr><td>Performance Test NBP Module</td><td>Accuracy Test
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Connect the manometer and the pump with tubing and expansion chamber to the NBP connector on the NBP Module.</td></tr>
<tr><td>2</td><td>Go to Service Mode.</td></tr>
<tr><td>3</td><td>Press the NBP button on the NBP Module.</td></tr>
<tr><td>4</td><td>Press Start button in the task window to close valves.</td></tr>
<tr><td>5</td><td>Raise the pressure to 280 mmHg with the manometer pump.</td></tr>
<tr><td>6</td><td>Wait 10 sec for the measurement to stabilize.</td></tr>
<tr><td>7</td><td>Compare the manometer values with the displayed values.</td></tr>
<tr><td>8</td><td>Document the value displayed by the Monitor.
If the difference is greater than 3 mmHg, calibrate the module.</td></tr>
</table></td><td>Value displayed on Monitor = x1

If difference (<= 3mm)

Proceed to next test.</td><td></td></tr>
<tr><td>Performance Test NBP Module (contd.)</td><td>Leakage Test
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Press the NBP button on the Module.</td></tr>
<tr><td>2</td><td>Press the Start softkey in the task window.</td></tr>
<tr><td>3</td><td>Pressurize the gauge to 280 mmHg.</td></tr>
<tr><td>4</td><td>Watch the pressure value for 60 seconds. After 60 seconds the value should have decreased by less than 6 mmHg.</td></tr>
<tr><td>5</td><td>Calculate and document:
Leakage test =
Accuracy – displayed value</td></tr>
</table></td><td>Leakage test value = x2 (<= 6 mmHg)

Proceed to next test.</td><td></td></tr>
</table>

Table 2-4 Tests and Inspection Requirements*(Continued)*

<table>
<tr><th>Test Block Name</th><th>Test or “Inspection” to Perform</th><th>Expected Test Results</th><th>What to Record on Service Record</th></tr>
<tr><td></td><td>
Linearity Test
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Reduce the manometer pressure down to 150 mmHg.</td></tr>
<tr><td>2</td><td>Wait 10 sec for the measurement to stabilize.</td></tr>
<tr><td>3</td><td>Compare the manometer values with the displayed values.</td></tr>
<tr><td>4</td><td>Document the value displayed by the Monitor.
If the difference is greater than 3 mmHg then calibrate the module.</td></tr>
</table>
Valve Test
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Raise the pressure to 280 mmHg.</td></tr>
<tr><td>2</td><td>Press Stop on the module to open valves.</td></tr>
<tr><td>3</td><td>Wait 5 seconds then document the value.</td></tr>
</table>
</td><td>Value displayed on Monitor = x3
If difference (<= 3 mmHg)

Proceed to next test

Value displayed on Monitor = x4
(< 10 mmHg)</td><td>PN:P/x1/x2/x3/x4 or PN:F/x1/x2/x3/x4
where P = Pass
and F = Fail</td></tr>
<tr><td>Performance Test Sidestream CO_2</td><td>
Flow Adjustment Procedure
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Enter the CO_2 Sidestream Task Window by pressing Parameters followed by CO2 Sidestream.</td></tr>
<tr><td>2</td><td>Press Start Pump. The date and time of the last flow adjustment are displayed.</td></tr>
<tr><td>3</td><td>Start the Flow Adjustment procedure by connecting the flow meter and pressing Start Pump. After about 5 seconds, the flow in ml/min displays in the Task Window.</td></tr>
<tr><td>4</td><td>Use the Adjust Flow to adjust the value displayed in the Task Window to the value displayed by the external flow meter.</td></tr>
<tr><td>5</td><td>Write down the value displayed by the CMS (x1).</td></tr>
<tr><td>6</td><td>Press Confirm to store the readjusted flow rate value. After about 5 seconds, the message “Adjustment done” displays. The flow is automatically set to 100 ml/min.</td></tr>
<tr><td>7</td><td>If the displayed value is not 100 ml/min, repeat Steps 3 through 5.</td></tr>
</table>
</td><td>Value displayed on CMS = x1
(where x1 = 100 +/– 10 ml/min)

Proceed to next test</td><td></td></tr>
</table>

Table 2-4 Tests and Inspection Requirements*(Continued)*

<table>
<tr><th>Test Block Name</th><th>Test or “Inspection” to Perform</th><th>Expected Test Results</th><th>What to Record on Service Record</th></tr>
<tr><td>Performance Test Sidestream CO_2 (contd.)</td><td>Barometric Pressure Adjustment Procedure<table><tr><th>Step</th><th>Action</th></tr><tr><td>1</td><td>Press Barometer Pressure to adjust the Barometric Pressure value. The Task Window displays the stored barometric pressure in mmHg.</td></tr><tr><td>2</td><td>If the displayed value is incorrect, use the Barometer Pressure key to adjust the value to atmospheric pressure.</td></tr><tr><td>3</td><td>Document the Difference (x2) between the actual atmospheric pressure and the value displayed by the CMS.</td></tr><tr><td>4</td><td>Press Confirm to store the displayed or adjusted value. After about 5 seconds, the message “Adjustment done” displays. The barometric pressure is then set to the value you entered.</td></tr><tr><td>5</td><td>Press Main Screen (or Standard Display) to return to the standard display in Service mode</td></tr></table></td><td>Difference = x2
(<= 4 mmHg)</td><td>PSC:P/x1/x2
or
PSC:F/x1/x2
where P = Pass
and F = Fail</td></tr>
<tr><td>Performance Test ECG</td><td>Step 1 Connect the patient simulator to the ECG Parameter Module using the Patient cable.
Step 2 Configure the Patient simulator as follows:
ECG sinus rhythm
HR = 120 BPM (Amplitude 1 mV)
Step 3 Check displayed ECG wave and HR value against the simulator configuration.</td><td>HR = 120 +/– 2 BPM</td><td>These results do not have to be reported.</td></tr>
<tr><td>Performance Test Respiration</td><td>Step 1 Connect the patient simulator to the ECG/Resp Module using the patient cable.
Step 2 Configure the patient simulator as follows:
Base impedance line 1500 Ohm
Delta impedance 0.5 Ohm
Respiration Rate 40/min
Step 3 Check displayed respiration rate against the simulator configuration.</td><td>RPM = 40 +/– 2 /min</td><td>These results do not have to be reported.</td></tr>
<tr><td>Performance Test Cardiac Output</td><td>Step 1 Connect the patient simulator to the C.O. Module using the patient cable.
Step 2 Configure the Patient simulator as follows:
Injection temperature: 2 °C
Computation Const: 0.542
(Edward's Catheter)
Flow 5 l/min
Step 3 Check displayed value against the simulator configuration.</td><td>C.O. = 5 +/– 1 l/min.</td><td>These results do not have to be reported.</td></tr>
</table>

Table 2-4 Tests and Inspection Requirements*(Continued)*

Test Block Name	Test or "Inspection" to Perform	Expected Test Results	What to Record on Service Record
Performance Test Cardiac Output (contd.) **Service Tool procedure, Version 1**	***Note:*** *This procedure applies for Service Tool M1012-14232C and/or C.O. modules without option C10 and/or software revision B.0 and below.* **Step 1** Make sure to be in Monitoring Mode. Connect C.O. Interface Cable to module. **Step 2** Connect one side of the Service Tool to Injectate receptacle of C.O. Interface Cable and the other side to Catheter Cable receptacle. **Step 3** Enter Measure C.O. Task Window and check results.	 Tblood = 37.0°C +/- 0.1°C Tinj = 0.0°C +/- 0.1°C	These results do not have to be reported.
Performance Test Cardiac Output (contd.) **Service Tool procedure, Version 2**	***Note:*** *This procedure only applies for Service Tool M1012-61601 in combination with C.O. modules with option C10 and software revision C.0 and greater.* **Step 1** Make sure to be in Monitoring Mode. Connect C.O. Interface Cable to module. **Step 2** Connect one side of the Service Tool to Injectate receptacle of C.O. Interface Cable and the other side to Catheter Cable receptacle. **Step 3** Enter Setup C.O. Task Window and check results for: Method of Measurement Arterial Catheter Constant Enter Measure C.O. Task Window and check results. **Step 4** Disconnect Catheter Cable receptacle from Service Tool. **Step 5** Enter Module Setup Task Window. Press **Parameter On/Off.** Press **On/Off Setup** to switch Setup On **Step 6** Enter Setup C.O Task Window and change method of measurement to "Right Heart". **Step 7** Enter Measure C.O. Task Window and check results.	 Transpulmonary 341 Tblood = 37.0°C +/- 0.1°C Tinj = 0.0°C +/- 0.1°C	These results do not have to be reported.
Performance Test Invasive Pressure	**Step 1** Connect the patient simulator to the Pressure module. **Step 2** Set patient simulator to 0 pressure. **Step 3** Make a Zero Calibration with the module. **Step 4** Configure the patient simulator for P(static) = 200 mmHg. **Step 5** Wait for the display. **Step 6** Check displayed value against the simulator configuration. If there is a difference, calibrate the module. ***Note:*** *If the Module was calibrated with a dedicated reusable catheter, check the calibration together with this catheter.*	 P = 200 +/– 5 mmHg	These results do not have to be reported.
Performance Test Temperature	**Step 1** Connect the patient simulator to the temperature input. **Step 2** Configure the patient simulator to 40 °C or alternatively 100 °F. **Step 3** Check displayed value against the simulator configuration.	 +/– 0.2 °C or +/– 0.4 °F	These results do not have to be reported.

Table 2-4 Tests and Inspection Requirements*(Continued)*

Test Block Name	Test or "Inspection" to Perform	Expected Test Results	What to Record on Service Record
Performance Test SpO_2	**Step 1** Connect the sensor to the SpO_2 module. **Step 2** Measure the SpO_2 value on your own finger (this assumes that you are healthy). **Step 3** Check displayed value against the simulator configuration.	Between 95 and 100%	These results do not have to be reported.
Performance Test ECG-Sync	This test is recommended for customer sites where ECG Sync is in use or is configured for potential use. **Step 1** Connect the patient simulator to the ECG input and the defibrillator to the CMS ECG-Sync output. **Step 2** Configure the patient simulator as follows: ECG sinus rhythm HR = 100 BPM (Amplitude 1 mV) **Step 3** Switch defibrillator to simulation mode. **Step 4** Check that the marker pulse is displayed before the T-Wave begins.	Marker pulse is displayed before T-Wave begins.	These results do not have to be reported.
Performance Test Nurse Call Relay	This test is recommended for customer sites where the nurse call is in use. The Nurse Call Relay performance test is performed at the phone jack type connector. This test checks the operation of the Nurse Call Relay. The functionality of the Nurse Call depends on the configuration of the relay (see the CMS Configuration Guide). **Tools required:** Ohmmeter **Step 1** Plug a phono connector into the Nurse Call Relay connector. **Step 2** Connect the Ohmmeter. **Step 3** Simulate an alarm-free and then an alarm condition.	While no alarm occurs, the relay contacts are open. When an alarm occurs, the relay contacts close	These results do not have to be reported.
Performance Test BIS **PIC/DSC Test**	**Step 1** In Monitoring mode connect the **Sensor Simulator** (for maximum usage please refer to the documentation delivered with the Sensor Simulator) to the Patient Interface Cable **Step 2** Enter the BIS Task Window by pressing **Module Setup**, followed by **BIS**. **Step 3** Start Impedance Check by pressing **Start Check**. This brings up the BIS Cyclic Check Task Window. Check the displayed results.	Electrode 1: 4-6 kΩ Electrode 2: 8-12 kΩ Electrode 3: 1-3 kΩ	These results do not have to be reported.
Performance Test BIS (continued) **DSC Test**	**Step 1** Enter Service Mode **Step 2** Enter the BIS Task Window by pressing **Module Setup**, followed by **BIS**. **Step 3** Start Test by pressing **Test DSC**. Check the displayed results.	Module: **Test passed** BIS engine: **Test passed** DSC: **Test passed**	These results do not have to be reported.

Safety Tests

For Europe and Asia-Pacific:
M1165A, M1166A, M1167A
according to IEC 601-1:1988+A1+1991+A2:1995 = EN60601-1:1990+A1:1991+A2:1995

For the US:
M1175A, M1176A according to UL 544
M1177A according to UL 2601-1

The test procedures outlined in this section are to be used **only** for verifying safe installation or service of the product in question.

The set-ups used for these tests and the acceptable ranges of values are derived from local and international standards but may not be equivalent.

These tests are **not a substitute for local safety testing** where it is required for an installation or a service event.

If using the Metron Safety tester, use your local regulation to perform the test, *for example*, in Europe IEC601-1/IEC601-1-1, and in the U.S. UL2601-1. The Metron Report should print results with the names listed below, along with other data.

The Safety Tests required to ensure that the CMS is in safe working order are detailed in the following tables.

Table 2-5 CMS Test and Inspection Requirements – Safety

Test Block Name	Test or "Inspection" to Perform	Expected Test Results	What to Record on Service Record
Safety (1):	System Safety Test Enclosure Leakage Current / **Normal Condition:**	**Normal Condition** maximum leakage current = **x1**. x1 <= 100 µA IEC601-1, UL2601-1 (UL544 test not required)	**S1:P/x1/x2 or S1:F/x1/x2** where P = Pass and F = Fail
	System Safety Test Enclosure Leakage Current / **Single Fault Condition**	**Single Fault** maximum leakage current = **x2**. x2 is <= 500 µA (IEC601-1) or <= 300 µA (UL2601-1) or <= 100 µA (UL544)	
Safety (2):	Protective Earth	With mains cable: Maximum impedance = x <= 100 mOhms All authorities (IEC601-1, UL2601-1, UL544)	**S2:P/x or S2:F/x** where P = Pass and F = Fail

Table 2-5 CMS Test and Inspection Requirements – Safety

Test Block Name	Test or "Inspection" to Perform	Expected Test Results	What to Record on Service Record
Safety (3):	Patient Leakage Current AC	Maximum leakage current = x <= 50 µA @ 250V (IEC601-1 or UL2601-1) or <= 10 µA @ 120V without patient leads connected (UL544) or <= 20 µA @ 120V with patient leads connected (UL544)	**S3:P/x or S3:F/x** where P = Pass and F = Fail

Table 2-6 Safety Test Diagrams

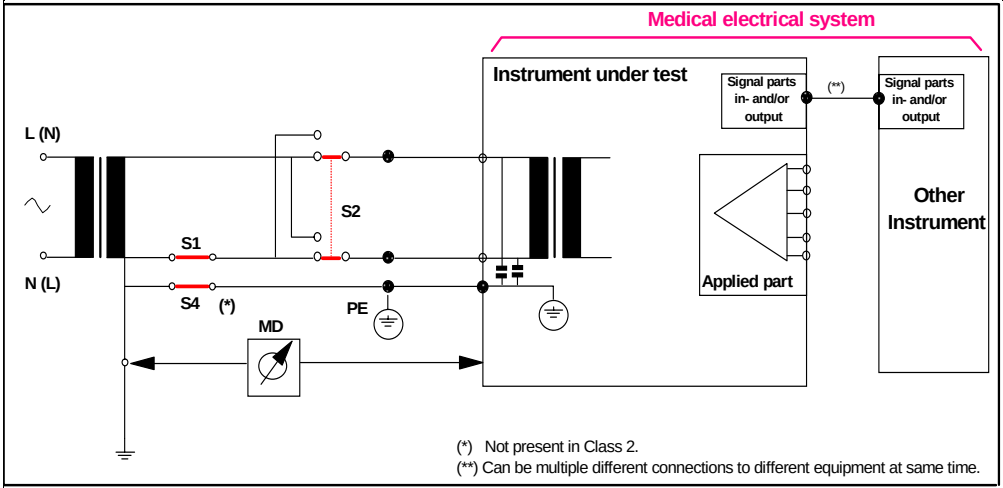
Test Block Name	Test or Inspection to Perform
Safety(1) System Enclosure Leakage Current – NC (normal condition)	 Measures leakage current of exposed metal parts of Instrument under Test (IUT) and between parts of the system within the **patient environment**; normal and reversed polarity using S2. *Safety test according to IEC 601-1-1 (Clause 19.201.1).* Report largest value.

Table 2-6 Safety Test Diagrams

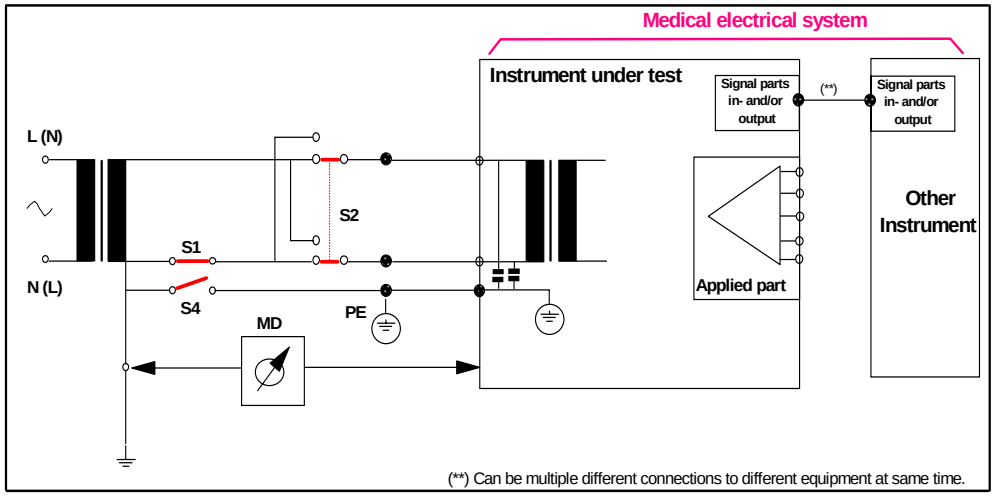
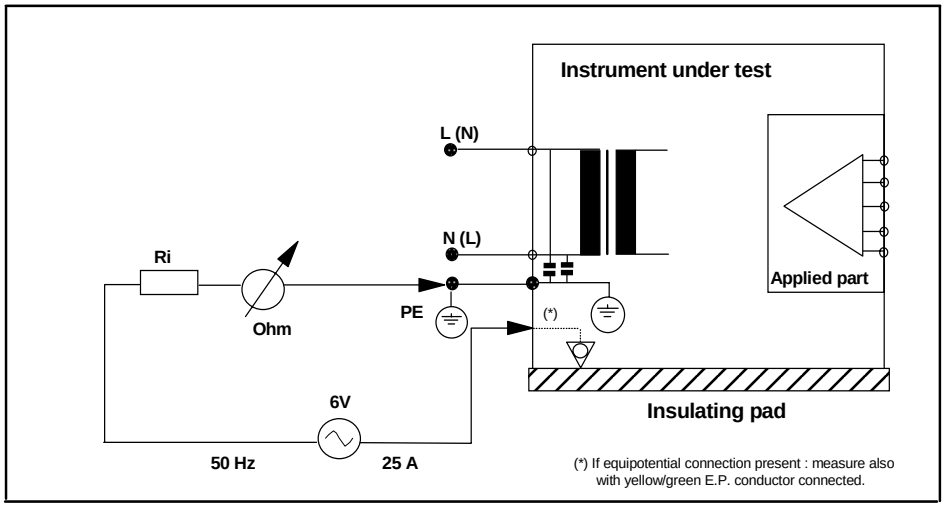
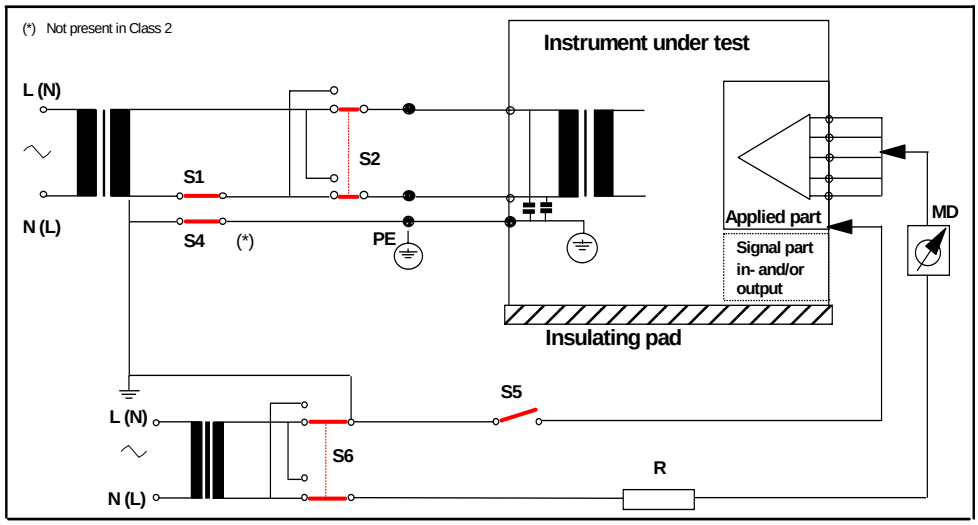
Test Block Name	Test or Inspection to Perform
Safety(1) System Enclosure Leakage Current – OE (open earth)	 Measures leakage current of exposed metal parts of IUT with Protective Earth (PE) open circuit (S4 = open) and between parts of the system within the **patient environment**; normal and reversed polarity using S2. *Safety test according to IEC 601-1-1 (clause based on 19.201.1)*. Report largest value.
Safety(2) Protective Earth	 Measures impedance of Protective Earth (PE) terminal to all exposed metal parts of IUT, which are for safety reasons connected to the Protective Earth (PE). Max. 100 mOhm. Test current 25 Amps applied for 5 to 10 seconds. The recommendation is to flex the main cable during the test in order to identify potential **bad** contact or damage of the earth wire. *Safety test according to IEC 601-1 (Clause 18)*. Report largest value.

Table 2-6 Safety Test Diagrams

Test Block Name	Test or Inspection to Perform
Safety(3) Patient Leakage Current – AC	 Measures patient leakage current from Applied Part to earth caused by external main voltage on Applied Part with switch S5 open and closed. Each polarity combination possible is tested using S2 and S6. This test is applicable for every listed module (ECG, ECG/Resp, Invasive Pressure, Cardiac Output, CO_2, SpO_2, SvO_2, FiO_2, EEG, Temperature). *Safety test according to IEC 601-1 (Clause 19.4.h).* Report largest value.

Preventive Maintenance Procedure for the Philips M1180A #A01 and #A02 Wall Mount Assembly

Overview

The objective of this procedure is to inspect the mounting hardware for proper operation.

NOTE **The Preventive Maintenance Procedure described in this section is a mandatory requirement, which has to be performed once a year. All fasteners should be checked and tightened or replaced as necessary.**

The procedure consists of the following steps:

Step 1 Inspect all visible mounting-related fasteners

Step 2 Check maximum tilt range

Step 3 Inspect mounting plate for movement

Step 1: Inspect visible fasteners

Please refer to the diagrams on page 2-16 and 2-17 for mounting component identification.

1. Inspect gold and silver stabilizing clips viewable from the rear of the monitor. If a clip is missing, install new clips to ensure safety of the mount (See picture below). The Kit M1180-60504 contains the three clips and the necessary screws.

2. Refer to the diagram on page 2-16, inspect all visible fasteners and tighten as required. If a fastener is broken or missing, install new fasteners. The Kit M1180-60504 contains the three clips and the necessary screws.

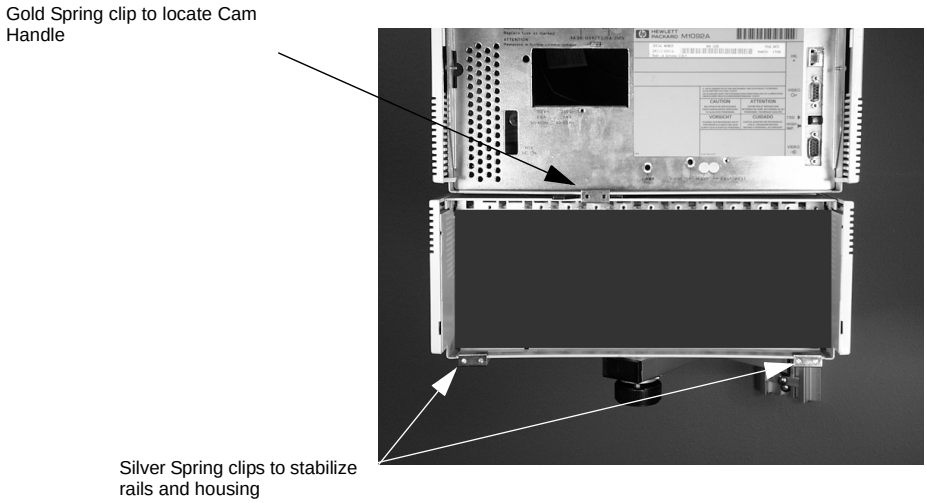
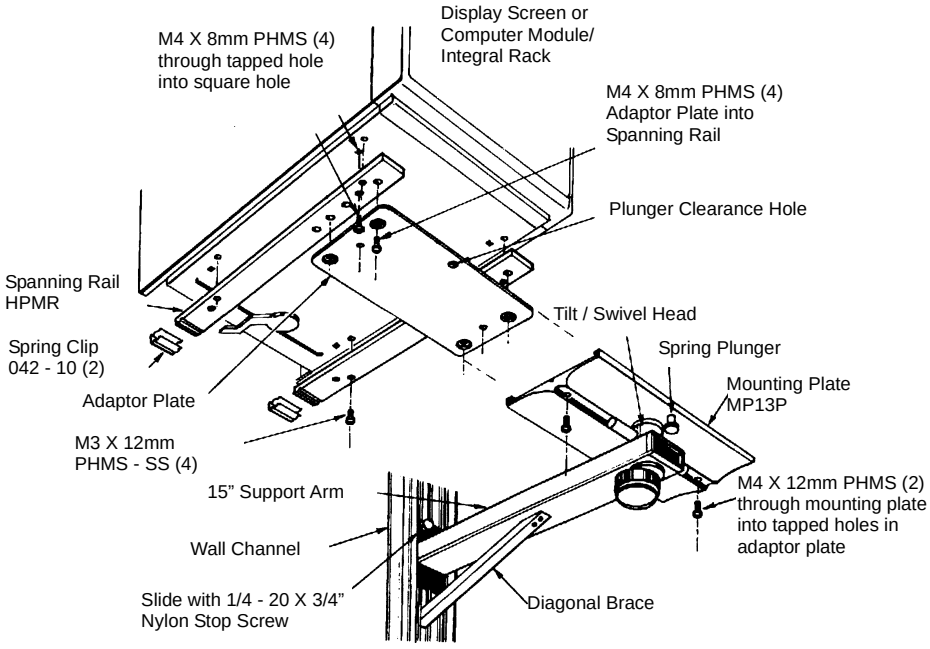


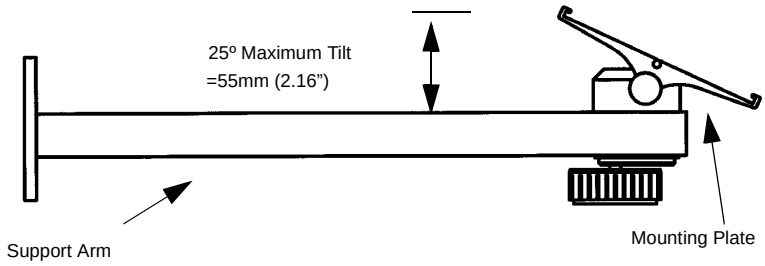
Figure 2-7. Wall Mount Components Diagram


Display Screen or Computer Module/ Integral Rack
M4 X 8mm PHMS (4) through tapped hole into square hole
M4 X 8mm PHMS (4) Adaptor Plate into Spanning Rail
Plunger Clearance Hole
Spanning Rail HPMR
Tilt / Swivel Head
Spring Clip 042 - 10 (2)
Spring Plunger
Mounting Plate MP13P
Adaptor Plate
M3 X 12mm PHMS - SS (4)
15” Support Arm
M4 X 12mm PHMS (2) through mounting plate into tapped holes in adaptor plate
Wall Channel
Slide with 1/4 - 20 X 3/4” Nylon Stop Screw
Diagonal Brace

Step 2: Check maximum tilt range

Please refer to the diagrams above and on page 2-17 for mounting component identification.

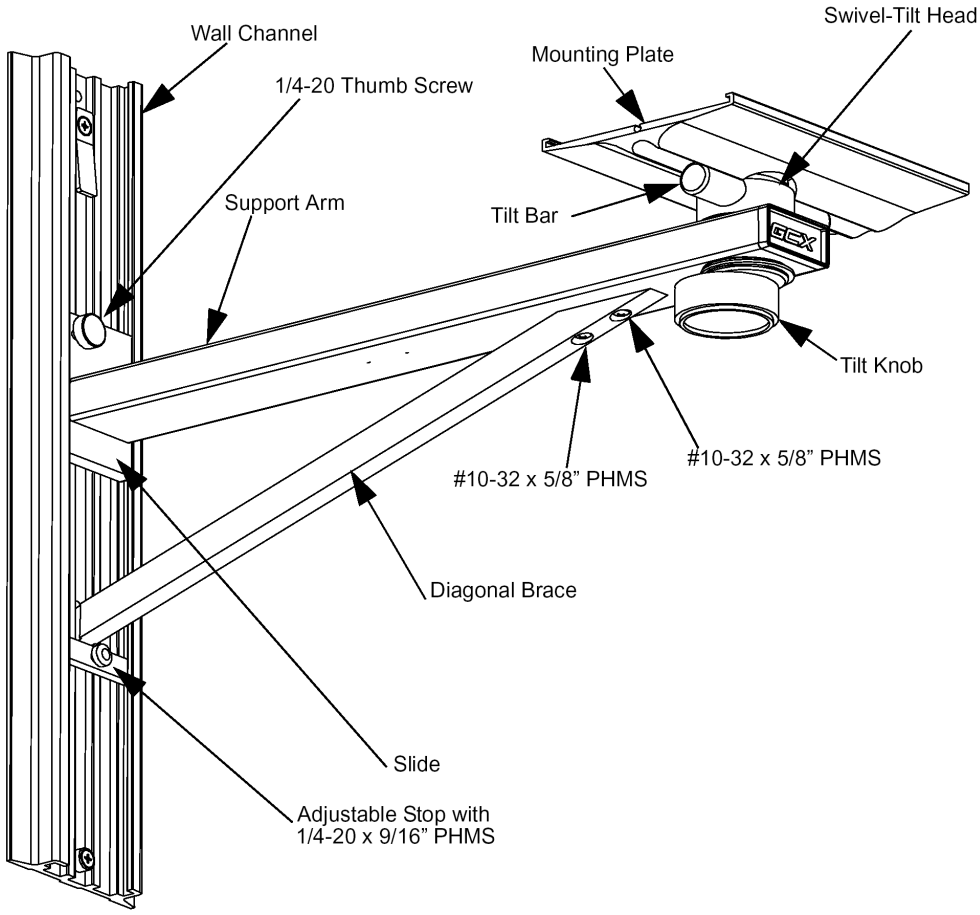
1. Rotate Tilt Knob counterclockwise until the knob stops. This is the maximum forward tilt angle. The maximum forward tilt range should not exceed 25° or 55mm (2.16”). (Refer to diagram below for reference angle). If the tilt range exceeds these specifications, the wall mount must be replaced.



Step 3: Inspect mounting plate for movement

1. With monitor set at desired tilt angle, apply pressure to the front of the monitor in an attempt to move it in a “rocking” motion. If the Mounting Plate “rocks”, or movement is observed between the mounting plate and tilt bar, the wall mount assembly **must** be replaced. ***Note***: Minor “flexing” movement of the entire mounting assembly is normal.
2. If no “rocking” is detected, the mounting assembly is functioning properly, and the inspection procedure is complete.

Figure 2-8. Wall Mount Assembly Diagram



General Inspections of the System

The CMS is designed to withstand the stresses of the Clinical Care environment. Each module of the system is encased in plastic and all of the cables and cords of the CMS are tested for patient safety. To keep your system in good physical condition, Philips recommends that you perform an annual inspection of the modules and cables of the CMS.

Objective

In order to meet the chapter's goals, you should be able to perform a general inspection of the CMS.

Concepts

The CMS is composed of various modules: the Display Module, the Computer Module, the plug-in modules, the plug-in module rack, the Handheld Keypad, and, in certain configurations, the remote power supply (for the flatscreen display module) or the External Alarm Device (used with an XGA-compatible display). Each module contains connectors, controls or cables that should be checked annually to ensure that they are in good condition and functioning normally.

Since the CMS is used in situations where the modules may come in contact with human fluids, you should follow all of the procedures of your department for dealing with contaminated equipment before proceeding with any maintenance procedures.

Inspect the System Hardware

Inspecting the system on an annual basis will help you keep track of your system and identify potential parts that need to be replaced.

No tools are required to perform this inspection.

Step 1 Examine the exterior of the unit for cleanliness and general physical condition. Check that the plastic housings are intact, that all hardware is present and tight, and that there are no signs of spilled liquids or other serious abuse.

Step 2 Check fuse values and type against that marked on the chassis, and ensure that a spare is provided.

Step 3 Inspect connectors of the module rack and ensure that the plug-in modules are locked into place and do not slide out without first releasing the locking plate on the bottom of the module.

Step 4 Ensure all labeling is present and legible.

Step 5 Inspect all accessories external to the system such as transducers, referring to the manufacturer's documentation.

Inspect the Cables

Cables and electrical cords could be potential hazards if they are not kept in good working condition.

A screwdriver may be required to complete this inspection.

Step 1 Examine the line/power plug for damage. Ensure that the prongs of the plug do not move in the casing. Shake the plug and listen for loose screws. If any damage is suspected, open the plug and inspect it.

Step 2 Inspect the line/power cord for signs of damage. If damaged, replace the entire cord or, if the damage is near one end, cut out the defective portion. Ensure that any new line/power cord or plug is fitted with the same polarity as the old one.

Step 3 Examine the strain reliefs at both ends of the line/power cord; be sure that they hold the cord securely.

Step 4 Inspect the interconnecting cables between the Display Module and the Computer Module for general condition. Examine them carefully to detect breaks in the insulation. Ensure that the cable connectors are properly engaged and that any connector screws are fully tightened.

Step 5 Inspect the patient cables and leads and their strain reliefs for general condition. Examine cables carefully to detect breaks in the insulation and to ensure that they are gripped securely in the connectors of each end to prevent rotation or other strain.

Step 6 Flex the patient cable near each end to verify that there are no intermittent faults.

Inspect the Red Power Indicators (LEDs) of the System

The power indicators light up every time the system is switched ON. This procedure is not applicable for the flatscreen. (Red LEDs are located inside the separate power supply.)

No tools are required to perform this inspection.

Step 1 Turn the System On by pressing the power switch in the lower left-hand corner of the CRT display.

Step 2 The system will click and light up the LEDs on the display. After several seconds, the LEDs will go off and the display will start showing waveforms and numerics if the monitor is in the monitoring or demo mode. If the system fails to boot, see the Troubleshooting chapter in this manual.

Step 3 Check the rear of the display module and compare the red LEDs that are visible to those in Figure 2-9.

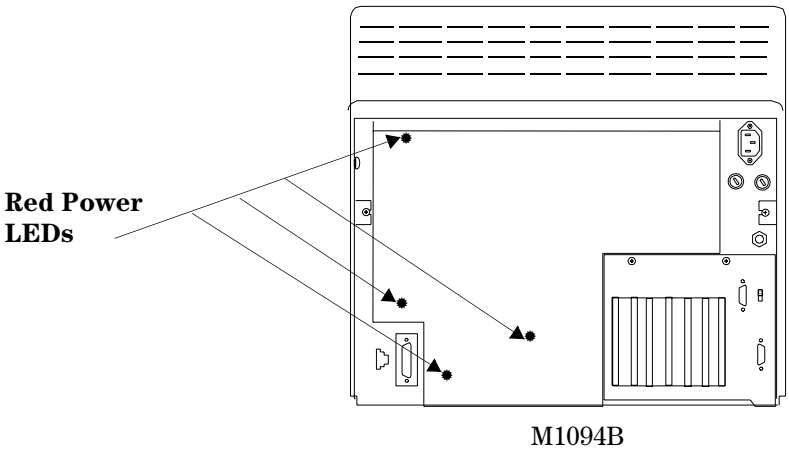


Figure 2-9. Red LEDs on the Rear Panel of the M1094B Display Module

Inspect the Display CRT / LCD

Inspecting the integrity of the display will help you verify that the display is working correctly.

A fixed rate simulator is required to perform the inspection.

Step 1 Note the positions of all of the shift, contrast and brightness controls (only brightness for the LCD display) so they are returned to their previous positions (assuming they are correct) at the end of the testing procedure.

Step 2 Set up an ECG signal on the screen from a fixed rate simulator. Check the baseline. It should stay in focus across the CRT and it should be horizontal, not noticeably sloped or bowed.

Step 3 Check the ECG complexes. They should be regularly spaced. Uneven spacing indicates a sweep non-linearity. All portions of a simulated ECG waveform should be clear and visible, including the P wave and QRS.

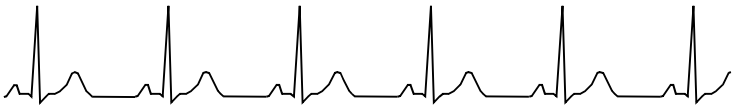


Figure 2-10. A Standard ECG Wave

Step 4 Using the V SHIFT control on the bottom rear of the CRT Display, vary the vertical position of the baseline. It should be possible to move the baseline through all of the vertical height of the CRT. There should be no distortion on the baseline as it is moved up or down on the screen.

Step 5 Adjust the contrast and brightness controls so that they are at the maximum settings and then adjust them so that they are at the minimum setting. (For the CRT, the phosphor may “burn”: check the condition of the phosphor on the CRT by noting if any “burn” spots [discoloration] are visible.)

Step 6 With the ECG simulator attached, check to see if any noise (interference) is superimposed on the baseline. Baseline interference may be apparent as a thick baseline at high gain settings (using V AMP, H AMP and EAST WEST controls on bottom rear of Display), but should not be visible throughout the lower two-thirds of the gain control range.

Step 7 Apply an external 1 mV pulse. The trace should exhibit a leading edge with minimal rounding and a spike (or overshoot) of less than 10%. After 1 second, the pulse should have decayed no more than half of its original amplitude.

Step 8 Return the controls to their previous positions (assuming they are correct). Refer to the Troubleshooting section if any problems were identified.

NOTE The fluorescent tube ("backlight") in the Flatscreen Display module will darken over time, resulting in a dimmer display. As a preventive maintenance procedure, it is recommended that the tube be replaced after a certain time of continuous use or if an unacceptable decrease in backlight intensity is noted. Please refer to "M1095A Backlight Removal and Replacement Procedures" in Chapter 5 "Repairing the CMS"

Inspect the Controls of the System

Step 1 Examine all controls (hardkeys, softkeys, arrow keys, ON/OFF switch, contrast and brightness controls as shown in Chapter 1 "Introducing the CMS" (Figure 1-3) for physical condition. During the course of this examination, ensure that the controls perform their proper function as stated.

Step 2 Check the module LEDs, see that they light up as expected. Pressing a module setup key should light up the setup indicator above the key.

Step 3 Press the ECG key on the front of the ECG module in a system that is turned On. This brings up the ECG Task Window and verifies that the computer module and integral rack are communicating with the plug-in module. If the ECG module does not respond, perform the module self-test or check the troubleshooting chapter.

Step 4 Confirm that the green LED of the Power indicator on the lower left-hand corner of the display is functioning.

Step 5 Ensure correct operation (visually and audibly) of all Alarms using, if required, the User Guide and a Patient Simulator (Neurodyne Nevada Inc. Model 217A or medSim 300 or similar).

Step 6 If possible connect the ECG parameter module of the unit to an ECG simulator and verify that an adequate trace is received at each patient lead selection.

Step 7 If your system uses a handheld keypad, check the integrity of the adhesive on the mounting bracket. It is important to note that adhesives are more prone to failure in hostile (warm, humid) environments.

Cleaning and Disinfecting Procedures

This section details the cleaning procedures for the System as a whole and for the Recorder and Blood Analysis Modules in particular.

Objective

In order to meet the chapter's goals, you should be able to understand which cleaning and disinfecting agents you should use to safely clean a CMS.

Concepts

The CMS is composed of various different modules: the Display, the Computer Module, the Plug-In Modules, the Module Rack, the Flatscreen Power Supply and the Handheld Keypad. Each module contains connectors, controls or cables that should be cleaned regularly to ensure that they are in good condition and functioning normally.

Since the CMS is used in situations where its modules may come in contact with human fluids, you should follow all of the procedures of your department for dealing with contaminated equipment.

WARNING **Philips makes no claims regarding the efficacy of the listed chemicals or methods as a means for controlling infection. Consult your hospital's Infection Control Officer or Epidemiologist.**

For comprehensive details on cleaning agents and their efficacy, refer to "Guidelines for Prevention of Transmission of Human Immunodeficiency Virus and Hepatitis B Virus to Health Care and Public-Safety Workers." issued by the U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Atlanta, Georgia, February 1989.

General Cleaning of the System

- The CMS should be kept free of dust and dirt.
- Exterior cleaning of the case and screen is recommended. Clean it with a lint-free cloth, moistened with either warm water (40°C/104°F. max) and soap, a diluted non-caustic detergent or one of the approved cleaning agents listed below:

Soaps	mild soaps
Tensides (dishwasher detergents)	Edisonite Schnellreiniger®, Alconox®
Ammonias	Dilution of Ammonia <3%, Window cleaner
Alcohol	Ethanol 70%, Isopropanol 70%, Window cleaner

CAUTION **To avoid damage to the product, observe the following general precautions for cleaning. You should only deviate when this is explicitly described in the cleaning instruction for the individual transducer or accessory.**

- **Do not use strong solvents such as acetone or trichloroethylene.**
- **Always dilute according to the manufacturers instructions, or use lowest possible concentration.**
- **Never use abrasive material (such as steel wool or silver polish).**
- **Do not allow liquid to enter into the product.**
- **Never submerge any part of the system.**
- **Do not pour liquid onto the system during cleaning.**
- **Do not allow cleaning agent to remain on any of the equipment surfaces - wipe it off immediately with a cloth dampened with water.**

CAUTION **If you want to clean a touch enabled display such as the M1097A #A02 Flatscreen Display, the touch operation has to be disabled during the cleaning procedure. If you use a mouse and want to clean it, mouse operation has to be disabled during the cleaning procedure.**
For more detailed information on how to perform these actions, please refer to the *User's Reference Manual*.

General Disinfecting of the System

We recommend that you disinfect the product only when necessary as determined by your hospital's policy, to avoid long term damage to the product.
We also recommend that the products being disinfected be cleaned first, as described under "General Cleaning of the System" on page 2-24.
Use the recommended disinfecting substances listed below:.

Alcohol based	Ethanol 70%, Isopropanol 70%, Cutasept®, Hospisept®, Kodan®Tinktur forte, Sagrosept®, Spitacid®, Sterilium fluid®. [1] only Ethanol 70% and Isopropanol 70% are tested and qualified
Aldehyde based	Dilution of formaldehyde (3-5%), Cidex®, Gigasept®. [2] only Cidex is tested and qualified
Bleach	Dilution of sodium hypochlorite (laundry bleach): concentration ranging from 500ppm (1:100 dilution of household bleach) to 5000ppm (1:10 dilution of household bleach), Hydrogen peroxide 3%, Chlorox® (1:10 dilution), Dakin's Solution.
Phenol based	Wofasept®, Sporicidin®.

CAUTION **To avoid damage to the product, observe the following general precautions for disinfection. You should only deviate when this is explicitly stated in the disinfecting instruction of a specific product.**

- **Do NOT use Povodine®, Sagrotan®, Mucocit® disinfecting agents or strong solvents e.g. acetone.**
- **Always dilute according to the manufacturer's instructions or use lowest possible concentration.**
- **Do not allow any liquid to enter the case.**
- **Never submerge any part of the system.**
- **Do not pour liquid onto the system during cleaning.**
- **Never use abrasive material (such as steel wool or silver polish).**
- **Do not allow any disinfecting agent to remain on any of the equipment surfaces – wipe it off immediately with a cloth dampened with water.**

CAUTION **If you want to disinfect a touch enabled display such as the M1097A #A02 Flatscreen Display, the touch operation has to be disabled during the cleaning procedure.**
If you use a mouse and want to disinfect it, mouse operation has to be disabled during the cleaning procedure.

Cleaning the Recorder Module

The paper roller and paper out sensors should be cleaned periodically.

Step 1 Open the recorder door and remove the roll of paper, if present.

Step 2 Use a lint free cloth and Isopropyl Alcohol to wipe the roller. Be sure to clean all sides of the roller.

CAUTION

To avoid damage to the roller, do NOT use any of the following cleaning agents:
- **Dilute sodium hypochloride (laundry bleach)**
- **Dilute formaldehyde**
- **Hydrogen peroxide**

Step 3 Use the same cloth to clean the inside casing of the Recorder Module.

Step 4 Use a bottle of compressed air to clean the paper out sensor that is located just below the paper roller.

The paper roller is cleaned to prevent paper slippage and to keep the recordings clean.

An optical sensor is used to detect when the recorder is out of paper. If an excessive amount of dust or dirt particles builds up around the sensor, the recorder will "think" it is out of paper even though this may not be the case.

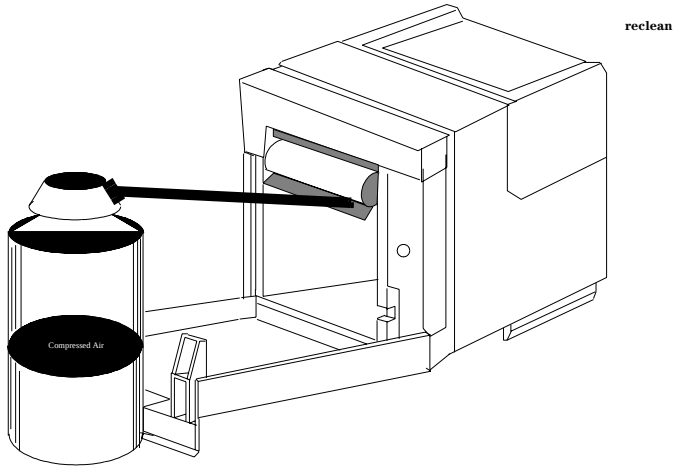


Figure 2-11. Cleaning the paper out sensor

If very slow speed (1 or 2 cm/min) recordings are run for extended periods of time, deposits of paper debris may collect on the printhead. Symptoms of this are recordings that are printed unevenly (have faint horizontal stripes).

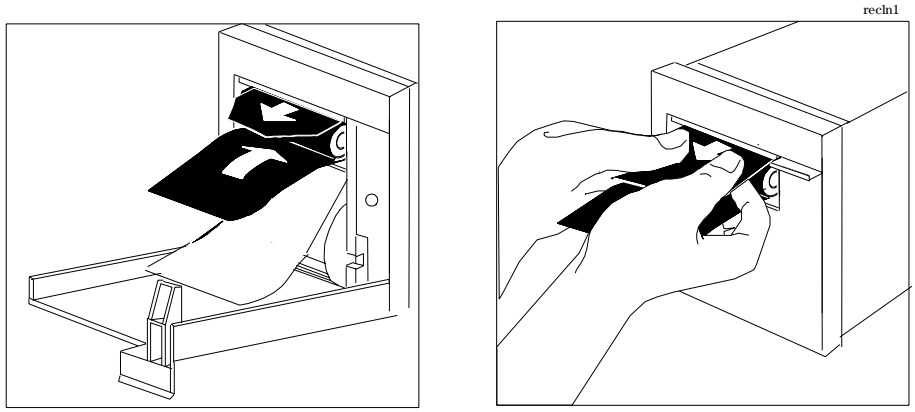
The print head should also be cleaned periodically.

Step 5 Thread a cleaning strip (included in the Recorder Module Cleaning Kit P/N M1116-60201) around the roller as in shown in diagram (A) below.

Step 6 Close the recorder door, with both ends of the strip and the paper extending over the top of the door.

Step 7 Grasp the top end of the strip as shown in diagram (B) below, and pull the strip out.

Step 8 Open the door, re-thread the paper, and resume normal operation. (For best results use only Philips Recorder Paper - P/N 40477A/B.)



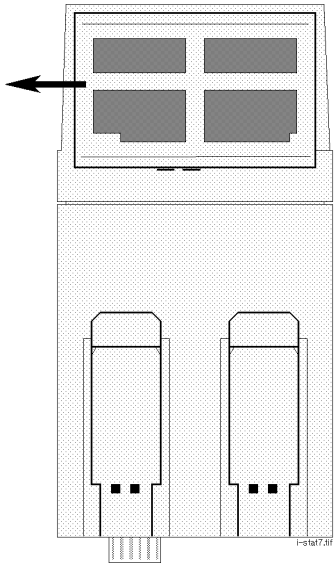
A B

Figure 2-12. Cleaning the Printhead of the Recorder Module

Cleaning the Blood Analysis Module

The filter for the ventilator fan should be cleaned periodically.

Step 1 Slide the filter cover on the underside of the module to the left and remove.



Step 2 Remove the filter from the cover.

Step 3 Rinse the filter under running water to remove any dust or debris.

Step 4 Shake the filter and leave to dry before replacing in the cover.

Chapter 3 Troubleshooting the CMS

This chapter describes how to troubleshoot the CMS as a system. Once a fault has been isolated to either the display module or computer module, this chapter tells you how to further isolate faults to the field replaceable assemblies. All references to the CMS also refer to ACMS or NCMS unless specifically stated.

Objectives

This chapter shows you how to:

- Recognize a properly operating CMS.
- Identify symptoms of improper operation for the CMS.
- Use any symptoms or indications to identify a fault as being in the display module, computer module, or the plug-in parameter modules.
- Further isolate faults down to field replaceable assemblies.

Concepts

This chapter uses visual indications, error codes, and other operational symptoms to help you diagnose problems with the CMS. Symptoms have been grouped to form troubleshooting modules.

Each troubleshooting module contains procedures for isolating faults based on the symptoms, any supporting theory as to why you are being told to do a certain procedure, and any additional rationale that will help you to isolate faults. The following table lists the troubleshooting modules.

Procedure Overview

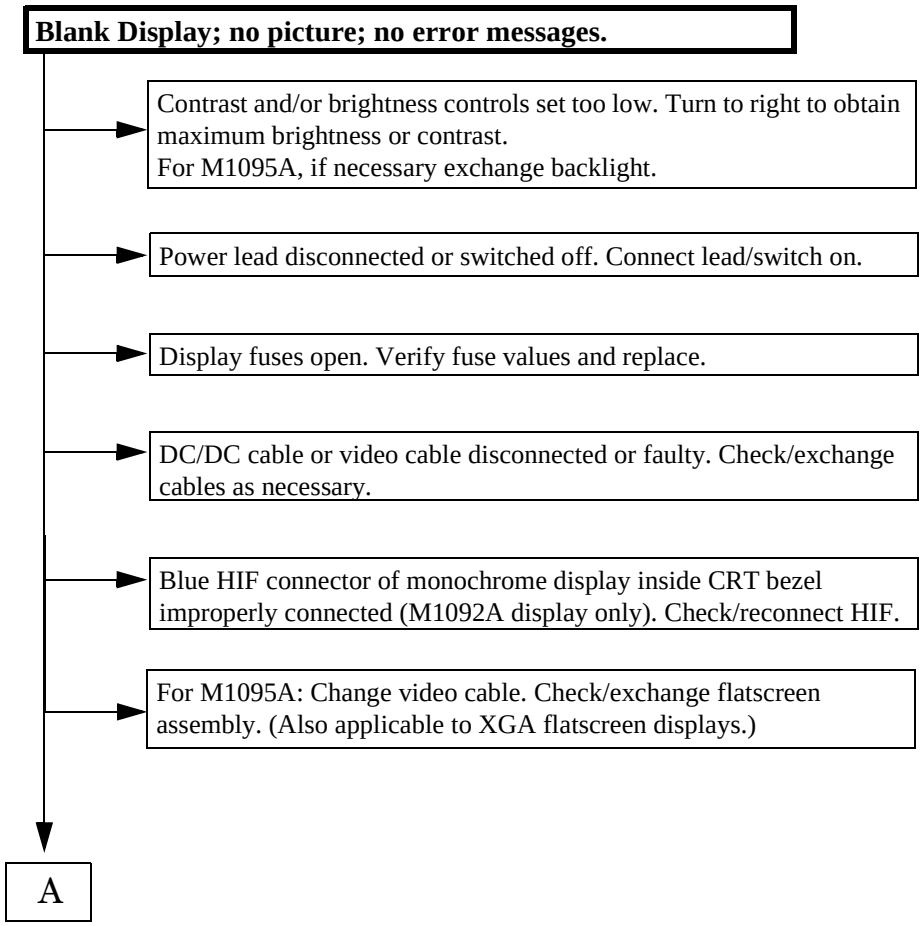
Table 3-1 Troubleshooting Procedure Overview

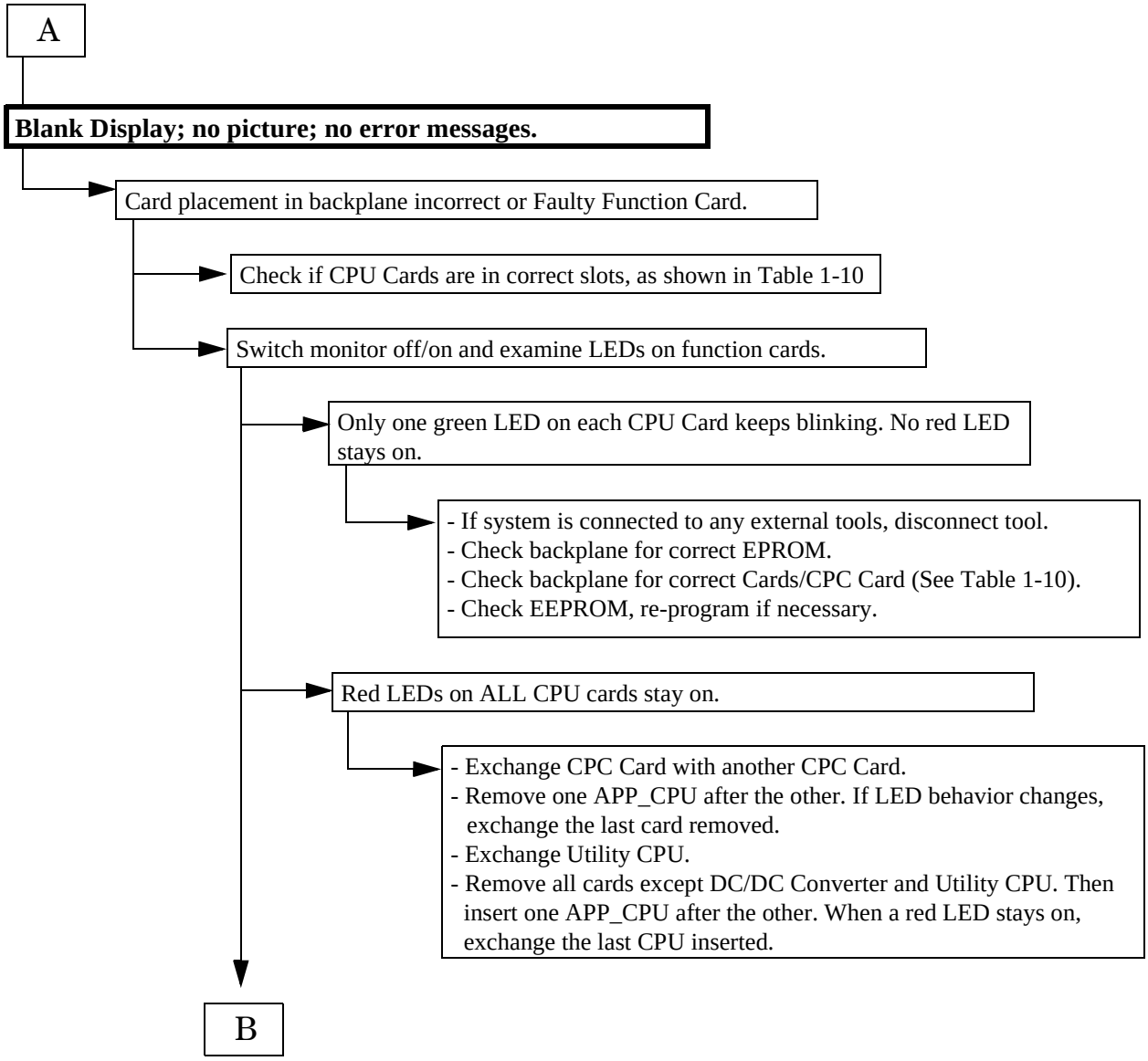
Topic	Page
General System Troubleshooting	3-3
Troubleshooting Module 1 - Fixing Display / Power Supply Problems	3-7
Troubleshooting Module 2 - Computer Module Faults	3-14
Troubleshooting Module 3 - Fixing Recorder Problems	3-35
Troubleshooting Module 4 - Fixing Handheld Keypad Problems	3-36
Troubleshooting Module 5 - Fixing Printing Problems	3-37
Troubleshooting Module 6 - Using the Service Mode	3-39

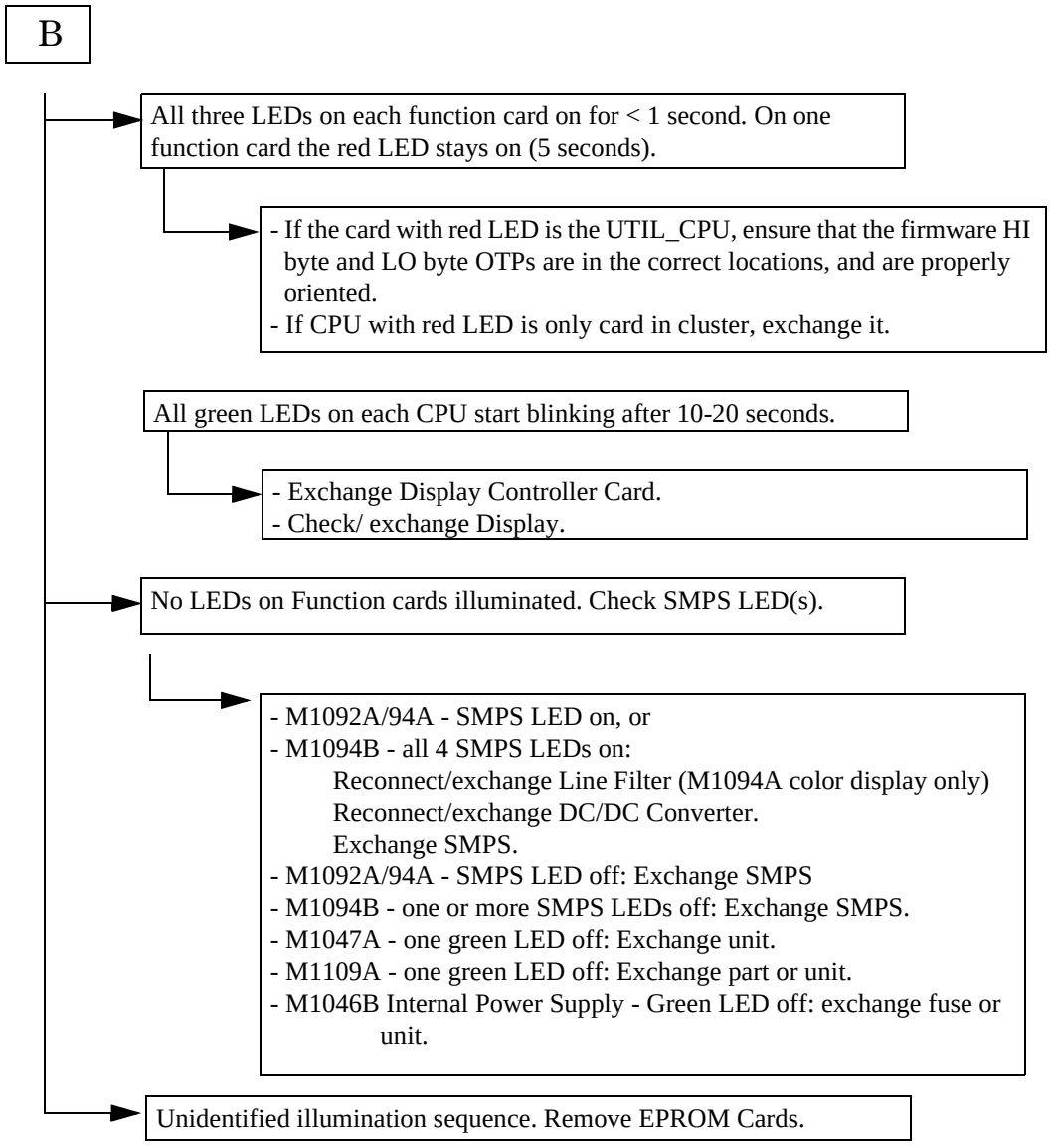
General System Troubleshooting

The following flowcharts are a good place to begin troubleshooting the CMS. Each bold box represents a general symptom of the monitor. After identifying the appropriate symptom, follow the arrow from the box to the possible corrective actions. If the first action listed does not resolve your problem, then proceed to the next box. If you need more help, proceed to the appropriate Troubleshooting Module.

The letter with a box around it is a guide to help you through the flowchart. The corresponding letter on the following page marks your place in the chart.


Blank Display; no picture; no error messages.
Contrast and/or brightness controls set too low. Turn to right to obtain maximum brightness or contrast.
For M1095A, if necessary exchange backlight.
Power lead disconnected or switched off. Connect lead/switch on.
Display fuses open. Verify fuse values and replace.
DC/DC cable or video cable disconnected or faulty. Check/exchange cables as necessary.
Blue HIF connector of monochrome display inside CRT bezel improperly connected (M1092A display only). Check/reconnect HIF.
For M1095A: Change video cable. Check/exchange flatscreen assembly. (Also applicable to XGA flatscreen displays.)
A


A
Blank Display; no picture; no error messages.
Card placement in backplane incorrect or Faulty Function Card.
Check if CPU Cards are in correct slots, as shown in Table 1-10
Switch monitor off/on and examine LEDs on function cards.
Only one green LED on each CPU Card keeps blinking. No red LED stays on.
- If system is connected to any external tools, disconnect tool.
- Check backplane for correct EPROM.
- Check backplane for correct Cards/CPC Card (See Table 1-10).
- Check EEPROM, re-program if necessary.
Red LEDs on ALL CPU cards stay on.
- Exchange CPC Card with another CPC Card.
- Remove one APP_CPU after the other. If LED behavior changes, exchange the last card removed.
- Exchange Utility CPU.
- Remove all cards except DC/DC Converter and Utility CPU. Then insert one APP_CPU after the other. When a red LED stays on, exchange the last CPU inserted.
B


B
All three LEDs on each function card on for < 1 second. On one function card the red LED stays on (5 seconds).
- If the card with red LED is the UTIL_CPU, ensure that the firmware HI byte and LO byte OTPs are in the correct locations, and are properly oriented.
- If CPU with red LED is only card in cluster, exchange it.
All green LEDs on each CPU start blinking after 10-20 seconds.
- Exchange Display Controller Card.
- Check/ exchange Display.
No LEDs on Function cards illuminated. Check SMPS LED(s).
- M1092A/94A - SMPS LED on, or
- M1094B - all 4 SMPS LEDs on:
Reconnect/exchange Line Filter (M1094A color display only)
Reconnect/exchange DC/DC Converter.
Exchange SMPS.
- M1092A/94A - SMPS LED off: Exchange SMPS
- M1094B - one or more SMPS LEDs off: Exchange SMPS.
- M1047A - one green LED off: Exchange unit.
- M1109A - one green LED off: Exchange part or unit.
- M1046B Internal Power Supply - Green LED off: exchange fuse or unit.
Unidentified illumination sequence. Remove EPROM Cards.

Keyboard and front panel switches not operating. Computer Module resets itself periodically.

- HIL cable between Display or External Alarm Device and Computer Module is reversed. Reconnect cable, matching the dot indicators.
- Faulty HIL cable. Exchange HIL cable.
- Faulty HIF board or blue HIF connector in Display bezel. Exchange HIF board.
- Faulty Utility CPU Card. Exchange Utility CPU.

System resets and all Patient Data is lost.

- SRAM checksum error on start-up. In Service Mode, perform the Extended Test. If the test indicates a faulty card, replace it.

Some or all waves/numerics missing.

- Plug-in Module(s) or Module Rack problem. See Chapter 4 “Troubleshooting the Plug-in Modules” for the module(s) in question.

Overview (SDN) user default settings automatically reset to factory defaults.

- For CMS Releases A - C: SDN connection has been interrupted (either through SCC power down, or SDN cable disconnection). In Configuration Mode, reconfigure the user defaults for all Overview.

Troubleshooting Module 1 - Fixing Display / Power Supply Problems

This module shows you how to troubleshoot problems based on symptoms given by a faulty display. Use this module when your CMS display is blank, showing incorrect data, or if you are referred to this module from another procedure.

Objectives

In order to meet this chapter's goal, you should be able to:

- Identify faulty conditions.
- Determine if your fault lies in the display or in the computer module.
- Know the likely causes of the fault and the likely remedy of the fault.

Concepts

The display monitors (M1092A - monochrome, M1094A/94B - color, M1095A - color flatscreen, or XGA-compatible display) use basically the same signal path to display patient data on the screen. The big difference is in the type of display controller cards used. The M1092A uses a display controller card called the DSPC. Both the M1094A and M1094B use a color display controller card called the CDSPC. Older versions of the CDSPC did not have enough RAM and two CDSPC cards had to be used. However, the newer versions of the CDSPC contain the necessary RAM and only one is needed.

The Application CPU in the computer module produces the data to be displayed. The DSPC and CDSPC cards control the mechanism of displaying the information on the screen. All of the inputs to the CRT displays come through a 9-pin D-type video-in plug on the rear of the display.

The Flatscreen uses one display controller card called DSPC_FLAT. All the inputs to the display come through a 25-pin twisted pair cable plugged in at the rear of the Flatscreen.

The XGA-compatible display uses one display controller card called CDSPC_XGA. All the inputs to the display come through a standard 15-pin cable.

To troubleshoot a faulty display condition perform the following procedure.

Procedures

If the CRT display is blank...

Check power LED.

❑ If the display is blank, the first thing to check is the green LED near the power switch on the front of the display module. When the CMS is plugged into a correct power source and the power switch is pressed to ON, this LED should illuminate GREEN.

When you verify the two conditions are true (CMS plugged in and power switch ON) and the LED is not GREEN, check the fuse. If the fuse is blown, replace the fuse. If fuse continues to blow, there is a problem in the display, and the display should be replaced.

If the fuse is good and the LED is not GREEN, it is possible that the low-voltage output from the Switch Mode Power Supply is not present. Proceed to the next step. If the LED is GREEN, and the fuse is good, and the display is blank, proceed to the next step.

Check contrast and brightness controls.

❑ The contrast or brightness controls may have been turned down too low. Turn both controls fully to the right and see if this fixes your problem. If nothing at all happens to the screen when you turn the controls to the right, the high voltage output from the SMPS may not be present and the display might need to be replaced. Proceed to the next step.

If when you turn the controls to the right a raster appears, the fault could be in the DC-to-DC converter in the computer module. Look at the rear of the Computer Module and locate the Utility CPU board. The Utility CPU board should have three green LEDs illuminated. If it does not, replace the DC-to-DC converter. If the LEDs are illuminated green, refer to the section CMS System Hardware/Software Problems on page 3-27.

Check video cable.

❑ The video cable from the Computer Module to the Display is not connected correctly. Check the connection and reconnect if necessary. If the connection is correct, the cable may be faulty. Replace the cable and see if this corrects the problem.

Check HIF connector.

❑ The blue human interface connector of the monochrome display in the front assembly is improperly connected. Remove the front assembly and check the connector and reconnect if required.

Check DSPC Card(s).

❑ The wrong display controller (DSPC) card is in the Computer Module. If the wrong DSPC Card is in the backplane or the DSPC is missing from the backplane, the display may be blank. Check that the DSPC Card(s) is/are CMS display controller card(s) and that it is in the correct slot.

If the monitor is color, ensure that the DSPC_Color Card (or both a CDSPC_VIDEO and CDSPC_CTRL Card) is plugged into the correct slot(s) in the backplane.

Check Functional Cards.

❑ The card placement in backplane is incorrect/faulty function card is present. If the corrective actions in General System Troubleshooting on page 3-3 did not resolve the symptom, refer to section Procedures on page 3-14.

If there is poor display quality, inverse video, incorrect colors, faded image, ghosting, a scrambled picture, or missing information on the CRT display...

Check video termination.

❑ The video termination switch on the rear of the display may be improperly set. If only a main display is being used, the main switch should be placed to **Switch ON (in)**. If a second (remote) display is connected to the main display, the switches should be set as follows:
Main: **Switch OFF (out)** Slave: **Switch ON (in)**

Check video cable.

❑ The video cable from the Computer Module to the Display is not connected correctly. Check the connection and reconnect if necessary. If the connection is correct, the cable may be faulty. Replace the cable and see if this corrects the problem.

Check degaussing coils.

❑ If you have a color display, there is a chance the de-gaussing coils of the CRT are faulty. These coils de-magnetize the CRT using two positive temperature coefficient thermistors. The current flow (maximum when cold, minimal when hot) changes as the thermistors heat up. Turn the unit off and wait 30 minutes for the thermistors to return to room temperature. Then turn the unit on. If the problem goes away and then returns after several minutes, suspect the de-gaussing circuit and replace the display.

Check display controller.

❑ The display controller in the computer module may be faulty. You can check this by re-booting the unit and checking the Status Log for any error codes concerning the display controller. If so, replace the display controller.

If you suspect the display controller is faulty, but there is no error code in the status log, refer to Procedures on page 3-14 to further isolate the problem.

Another condition can exist where you have a color monitor connected to a monochrome display controller or vice-versa. Check you have a match between your monitor and the display controller card. Refer to Procedures on page 3-14 to check the exact placement of your display controller.

Check blue HIF connector.

❑ The blue human interface connector in the front assembly is improperly connected. A way to check this is by turning the brightness and contrast controls to both the left and the right. If the screen remains unaffected, remove the front assembly and check the connector and reconnect if required. If the connector is intact, suspect the Human Interface board in the display bezel and replace it.

Check plug-in modules.

❑ If you have known waves or numerics missing from the screen but the screen is behaving normally, refer to Troubleshooting Module 3 - Plug-In Module Faults.

Go to...

If you have come this far and have not fixed your problem, go to Procedures on page 3-14. That module tells you how to check to see if the Computer Module Unit is working correctly. If the Computer Module Unit is working correctly, replace the display.

If the (M1095A) Flatscreen Display is blank...

❑ If the Flatscreen Display (M1095A) is blank, the first step is to check the green LEDs on the front of the display and on the power supply. The power supply is one of the following: M1047A Power Supply, a CRT Display (M1092A, M1094A or M1094B), or the M1046B Integral Power Supply. When the CMS is plugged into a correct power source and the power switches on the display and power supply are pressed to ON, both LEDs should illuminate GREEN.

When you verify that the two conditions are true and that the LEDs are not GREEN, check the fuses at the rear of the module that is supplying power, the Power Supply M1047A, CRT Display, or M1046B. Replace any blown fuses. If fuses continue to blow, there is a problem in the Display and/or the Computer Module.

❑ Video/Power Cable
Check the video/power cable connection and reconnect if necessary. If the connection is correct, the cable may be faulty. Replace the cable to see if this corrects the problem. Check the video/power cable if: the LED on the M1047A Remote Power Supply is green, the LED on the Flatscreen is blank, and the red LEDs in the Computer Module are inactive.

❑ M1047A Power Supply
If you suspect the M1047A Power Supply, test the Remote Control Board to determine whether this board or the Switch-Mode Power Supply itself is faulty. The Remote Control Board has a 12V(AC) input and outputs 12V(DC) to an optocoupler on the SMPS. Output from the SMPS is 60V(DC). Exchange part number for the Remote Control Board is 31192086411FMI. If the SMPS is faulty, replace the complete Power Supply.

If the LEDs are green and the fuses are good but the display is blank, proceed to the next step.

❑ Computer Module
Check that the correct cards are located in the correct slots in the Computer Module. In particular check that the Flatscreen Display Controller Board is correctly located. Look at the rear of the Computer Module. The Utility CPU board should have three green LEDs illuminated plus one green blinking LED and the Flatscreen Display Controller Board should have one green blinking LED. Note that the Flatscreen Display Controller Board outputs 60V via the video/power cable to the Flatscreen Display. This board is protected with an SMT fuse.

❑ Flatscreen Display
If you suspect the Flatscreen Display, check whether the backlight is defective. See Chapter 5 “Repairing the CMS” for this procedure. Alternatively, the LCD or the video board may be defective. If the LCD is defective, exchange the complete display.

If there is poor display quality on a Flatscreen Display...

❑ Check video cable
Check the video cable connection and reconnect if necessary. If the connection is correct, the cable may be faulty. Replace the cable to see if this corrects the problem.

❑ Flatscreen Display Controller
The Flatscreen Display Controller Board in the Computer Module may be faulty. You can check this by re-booting the unit and checking the Status Log for any error codes concerning the display controller.

If you suspect that the display controller is faulty but there is no error code in the status log, refer to Troubleshooting Module 2 - Computer Module Faults to further isolate the problem.

❑ Verify the integrity of the display
Go to demo mode to verify the integrity of the display. The ECG complexes should be regularly spaced and all portions of the ECG waveform should be clear and visible. (A small number of missing pixels is normal with all LCD displays but, if the ECG waveform is not clear, this is an indication of an unacceptable number of pixel failures.)

It may be useful to use the white test picture in service mode.

If the display exhibits other quality problems such as misalignment or jitter, and you have checked the Video/Power cable and the Flatscreen Display Controller Card, this means that there is a problem in the Flatscreen Display itself and the display should be replaced. (For board-level troubleshooting, sound or control problems indicate that the HIF board is faulty; problems with the picture indicate that the video board is faulty.)

❑ Display Brightness
The brightness control may be turned too low or the flatscreen display may not be angled for optimum viewing. If the display is still too dim with the brightness control at maximum, change the backlight. See Chapter 5 “Repairing the CMS” for this procedure.

❑ Check plug-in modules
If you have known waves or numerics missing from the screen but the screen is behaving normally, refer to Troubleshooting Module 3 - Plug-In Module Faults.

If an XGA Display is blank...

- ❑ If the XGA Display is blank, the first step is to check the green LEDs on the front of the display and power supply. When the CMS is plugged into a correct power source and the power switches on the display and power supply are pressed to ON, both LEDs should illuminate GREEN.

  When you verify that the two conditions are true and that the LEDs are not GREEN, check the fuses at the rear of the display, power supply and the computer module. Replace any blown fuses. If fuses continue to blow, there is a problem in the Display and/or the Computer Module.

- ❑ Video/Power Cable
  Check the video/power cable connection and reconnect if necessary. If the connection is correct, the cable may be faulty. Replace the cable to see if this corrects the problem.

- ❑ Power Supply
  If you suspect the Power Supply, test the Remote Control Board to determine whether this board or the Switch-Mode Power Supply itself is faulty. The Remote Control Board has a 12V(AC) input and outputs 12V(DC) to an optocoupler on the SMPS. Output from the SMPS is 60V(DC). Exchange part number for the Remote Control Board is 991920864111FMI. If the SMPS is faulty, replace the complete Power Supply.

  If the LEDs are green and the fuses are good but the display is blank, proceed to the next step.

- ❑ Computer Module
  Check that the correct cards are located in the correct slots in the Computer Module. In particular check that the Flatscreen Display Controller Board is correctly located. Look at the rear of the Computer Module. The Utility CPU board should have three green LEDs illuminated plus one green blinking LED and the Flatscreen Display Controller Board should have one green blinking LED. Note that the Flatscreen Display Controller Board outputs 60V via the video/power cable to the Flatscreen Display. This board is protected with an SMT fuse.

- ❑ Flatscreen Display
  If you suspect the Flatscreen Display, check whether the backlight is defective. See Chapter 5 “Repairing the CMS” for this procedure. Alternatively, the LCD or the video board may be defective. If the LCD is defective, exchange the complete display.

NOTE

Note: For the XGA display, the switch on the External Alarm Device operates the computer module; the green LED on the Alarm Device shows whether it is on.
If there are technical problems with the XGA display, consult the display device’s own service documentation.

If the TouchScreen operation is malfunctioning...

- ❑ Check cable connection between the RS232 connectors of the display and the function box. Reconnect, if necessary.
- ❑ Perform a visual inspection of the overlay. If the overlay is visibly damaged, it has to be replaced.
- ❑ Check the RS232 configuration:

  Step 1 Enter Config Mode and press Monitor Setup .

  Step 2 Press RS 232 . This leads you to the RS232 setup window.

  Step 3 Make sure that the entries behind Port 1-4 show the correct devices. If not, select the correct devices for each port.

  Step 4 If you had to change the configuration, save it and switch power off and on.

  Step 5 If the problem still exists, proceed with the next step.

- ❑ Perform a Touch Screen calibration:

  Step 1 Enter Config Mode and press Monitor Setup .

  Step 2 Press Touch Setup . This leads you to the Touch Screen Setup window.

  Step 3 Perform the calibration procedure. Follow the steps as shown on the screen.

If the font appears to be incorrect...

After installing a display controller card, if the font appears to be incorrect, it may be because the Font ROM Switch setting for the language is incorrect. See “Configuring the Display Controller Card” in Chapter 5 “Repairing the CMS” for details.

Troubleshooting Module 2 - Computer Module Faults

This module shows you how to troubleshoot problems based on symptoms given by a faulty Computer Module. Use this module when you suspect you have a problem in your Computer Module, or when you are referred to this module from another procedure.

Objectives

In order to meet this chapter's goal, you should be able to:

- Identify faulty conditions.
- Verify the correct function card locations in the Computer Module.
- Know what are the likely causes of the fault and what are the likely remedies.
- Use the Status Log to check for error codes, and other service information.
- Interpret error codes and how to use them to isolate faults.

Concepts

Each function card in the CMS comes with a red LED that illuminates to indicate a fault with the card. There are also green LEDs on each function card that show the normal operation of the system. Also associated with most fault conditions are **Error Codes** that can be viewed in the **Status Log** of the operating modes. This module uses each of these items to isolate faults and to determine the health of the Computer Module.

Error Codes

The first line of fault isolation is the **Error Codes**. Whenever one of the function cards is unable to perform an operation, an error code is generated. Error codes can be for fatal and non-fatal errors. **Fatal** errors are errors which cause the CMS to re-start. **Non-fatal** errors are general errors that are not significant enough to affect normal CMS operation.

Fatal error codes can be found in the **Status Log** while in any of the four operating modes. In the Service Mode, the Status Log also displays Non-fatal error messages. **If an error occurs when the** CMS **is starting up, a start-up error code is generated** and displayed at the top of the screen. Start-up error codes give similar information to that of the Status Log entries, except the codes are given are in hexadecimal notation.

What an Error Code Tells You

When you look at an error code in the Status Log, you can see the following information:

Table 3-2 Error Code Description

Field	Description
H, W, C or F	H, W, and C denote fatal errors which have caused a **H**ot, **W**arm, or **C**old start. F denotes a **F**atal error without deference to the type of restart caused.
Card Name	RACK_IF, for example
Part Number of function card	M1088-66501, for example
Device ID Code	The number referring to a hardware device or software module and used to indicate the location of a fault.
Slot number	Position of the faulty or **reporting** card in the computer module unit.
Error code	Number describing the type of fault identified. The error code tables in this module give more details.
Date\Time	Date and time the error occurred.

Using Error Codes

This section includes procedures on how to access the Status Log in the various operating modes, and what actions to take when a fatal error is encountered. This module includes error code lists for the errors reported by the CMS, grouped by **Device ID**, and the recommended course of action for each fault.

Two possible conditions may occur in which the CMS generates error code information. These conditions are:

- A fault causing the system to restart occurs, but upon restarting the fault clears. If this happens, begin with the first step of this procedure.
- A fault causing the system to repeatedly restart occurs. If this occurs, go to the segment of this procedure that explains **Using Start-up Error Codes**.

Using Status Log Error Codes

❑ Access the Status Log. You do this by:

Step 1 From any of the operating modes, press Monitor Setup (or Instrument Config) to bring up to the Selection Window.

Step 2 Use the ARROW keys to move the highlighting to the row of softkeys that include Status Log.

Step 3 Press the Status Log softkey. The screen displays the Status Log.

❑ Once in the Status Log, check it for entries that have an H, W, C, or F entered in their first field. This identifies fatal errors. We are only concerned with fatal errors because these are the errors which are significant enough to affect the CMS operation. Each fatal error shows you the following:

- The Function card which has reported the fault,
- The part number of the functions card,
- The device ID code which indicates the hardware device or software piece which caused the fault,
- Slot number of the function card reporting the fault,
- The error code describing the fault identified,
- The date and time the fault occurred. This is important because the status log contains the fourteen most recently occurring errors, with the most recent errors at the top.

❑ If you have more than one error message for a single incident, deal with the first occurring error message (error messages are listed chronologically by date and time) before dealing with the others pertaining to the incident.

❑ If you have fatal error codes in the Status Log, and you proceed with an EndCase (discharge from the monitor), the monitor will not enter Standby Mode. Instead, the monitor will go to Monitoring Mode. That is why it is a good practice to purge the Status Log after you have dealt with or recorded each error.

Using Start-up Error Codes

❑ If your CMS is re-starting repeatedly, a start-up error code may appear at the top of the screen. The start-up error code gives information similar to that displayed in the status log, except the start-up error codes are listed in hexadecimal notation. These codes are identified by an “H” at the end of the code.

❑ Start-up Error Messages require the same corrective action as the error messages found in the status log. The Error Code Listings at the end of this module contain the hexadecimal equivalent for each error code and device ID.

How Device ID Codes and Error Codes Relate to Each Other

For troubleshooting the CMS, the device ID code and the error code portions of the error message have an important relationship. Each device ID has a block of error codes assigned to it. A separate Error Code Listing has been setup for CMS's operating system, device ID code 16400, since most fatal errors occur in this area.

Refer to the Error Code Listing in this module for the device ID indicated by the error code. There are two tables in this module. The first is for device ID code 16400 (4010H). The second is for all other device IDs. The corrective actions listed in these tables are listed in one of the follow ways:

- For some device ID 16400 (4010H) corrective actions:
    - See "CMS System Hardware Configuration Problems" on page 3-23.
    - See "CMS System Hardware/Software Problems" on page 3-27.
    - See "CMS System RAM Problems" on page 3-27.
- For all other device IDs, specific corrective action depends on the type of error encountered. The error code listing gives you detailed instructions for each situation.

Identifying the Slot Number Using the Error Code Chart

For error codes in the range 1000 to 1999 ($03E8_H$to $07CF_H$) with Device ID 16400 (4010_H), you can directly identify the slot number of the faulty board, using the hexadecimal error code and the following chart.

Use the error code chart as follows:

Step 1 Locate the first three digits of the hex error code in the columns across the top of the chart.

Step 2 Locate the last digit of the hex error code down the left-hand row of the chart.

Step 3 Read the number at the point in the chart where the row and column intersect. This represents the slot number of the faulty board in the Computer Module. These error codes will normally be provided in hexadecimal at system start-up as part of a start-up error message. For most start-up errors, replace the card in the slot identified by this chart.

Table 3-3 Error Code Chart for Slot Location (Device ID 16400 or 4010H)

		Device ID 16400 (4010H) Only																	
		First Three Digits (Hex Error Code)																	
		03E	03F	040	041	042	043	044	045	046	047	048	049	04A	04B	04C	04D	04E	04F
				050	051	052	053	054	055	056	057	058	059	05A	05B	05C	05D	05E	05F
				060	061	062	063	064	065	066	067	068	069	06A	06B	06C	06D	06E	06F
				070	071	072	073	074	075	076	077	078	079	07A	07B	07C			
Last Digit of Hex Error Code	0		8	24	8	24	8	24	8	24	8	24	8	24	8	24	8	24	8
	1		9	25	9	25	9	25	9	25	9	25	9	25	9	25	9	25	9
	2		10		10		10		10		10		10		10		10		10
	3		11		11		11		11		11		11		11		11		11
	4		12		12		12		12		12		12		12		12		12
	5		13		13		13		13		13		13		13		13		13
	6		14		14		14		14		14		14		14		14		14
	7		15		15		15		15		15		15		15		15		15
	8		16		16		16		16		16		16		16		16		16
	9	1	17	1	17	1	17	1	17	1	17	1	17	1	17	1	17	1	17
	A	2	18	2	18	2	18	2	18	2	18	2	18	2	18	2	18	2	18
	B	3	19	3	19	3	19	3	19	3	19	3	19	3	19	3	19	3	19
	C	4	20	4	20	4	20	4	20	4	20	4	20	4	20	4	20	4	20
	D	5	21	5	21	5	21	5	21	5	21	5	21	5	21	5	21	5	21
	E	6	22	6	22	6	22	6	22	6	22	6	22	6	22	6	22	6	22
	F	7	23	7	23	7	23	7	23	7	23	7	23	7	23	7	23	7	23

Device ID 16400 (or 4010_H) Error Code Lists

The first table gives the error code listing for device ID 16400 (4010H). Each error code entry provides the following information:

Status Log Errors - the decimal number range the error code gives in its status log entry.

Start-up Error - the hexadecimal number range of the start up error code.

Possible Cause - the possible cause for the error code report.

Corrective Action - actions which are designed to isolate the fault to a replaceable assembly.

Table 3-4 Error Code Listing for Device ID 16400 (or 4010H)

Status Log Errors	Start-up Errors	Possible Cause	Corrective Action
1 - 99	0001_H - 0063_H	Hardware test failure in the first boot stage.	RAM problem- refer to the corrective action on page 3-27.
100 - 199	0064_H - $00C7_H$	Microprocessor interrupts due to a Hardware or Software problem in given slot or cluster.	Hardware/Software problem- refer to the corrective action on page 3-27.
200	$00C8_H$	MPB chip errors: Can be caused by hardware defects on the indicated CPU as well as hardware defects on any other MPB participant (Master Cards: for example Util CPU, APP_CPU, DSPC Ctrl, and others) in the system.	Hardware/Software problem- refer to the corrective action on page 3-27.
201 - 202	$00C9_H$ - $00CA_H$	System configuration problem or invalid contents of the Util_CPU EEPROM.	System Configuration problem - refer to the corrective action on page 3-23.
203 - 239	$00CB_H$ - $00EF_H$	Same as error 200	Hardware/Software problem- refer to the corrective action on page 3-27.
240	$00F0_H$	Message transmission problem.	System Configuration problem - refer to the corrective action on page 3-23.
241	$00F1_H$	Same as errors 203 - 239.	Hardware/Software problem- refer to the corrective action on page 3-27.
242	$00F2_H$	Message transmission problem.	System Configuration problem - refer to the corrective action on page 3-23.
243 - 299	$00F3_H$ - $012B_H$	Same as errors 203 - 239.	Hardware/Software problem- refer to the corrective action on page 3-27
300 - 301	$012C_H$ - $012D_H$	EPROM checksum incorrect.	With 10 and/or 15 MHz APP_CPU's in backplane, replace the EPROM in the cluster of the given slot.
			With 40 MHz CPC with Daughter Card in backplane, replace the Daughter Card.
			With 40 MHz CPC with Flash EPROM in backplane, reprogram Flash EPROM. If you still have a problem, replace CPC Card.
305 - 307	0131_H - 0133_H	Boot errors on CPC Card - software upgrade problem (for example: Flash Card corrupt). Will only occur when CPC Programming Tool is connected.	Switch the System off, re-insert the Upgrade Tool and switch the System on again. Replace the Flash Card. Replace the CPC Card in slot 12.
310 - 315	0136_H - $013B_H$	EPROM version and EEPROM version not compatible.	System Configuration problem - refer to the corrective action on page 3-23.

Table 3-4 Error Code Listing for Device ID 16400 (or 4010H)

Status Log Errors	Start-up Errors	Possible Cause	Corrective Action
330, 335	$014A_H$, $014F_H$	Only detected by the APP_CPU in slot 5 - indicates that another MPB participant (Master Card) does not boot up as required. There is no error in the indicated slot.	Hardware/Software problem- refer to the corrective action on page 3-27.
340, 356, 370	0154_H, 0164_H, 0172_H	Indication of communication problems between the APP_CPU in slot 5 and another MPB participant. The slot code may be incorrect.	Hardware/Software problem- refer to the corrective action on page 3-27.
380	$017C_H$	Firmware revision is incompatible with current Software revision.	System Configuration problem - refer to the corrective action on page 3-23.
390	0186_H	Indication of a communication problem between the CPC in slot 12 and another MPB participant. The slot code may be incorrect.	Hardware/Software problem- refer to the corrective action on page 3-27. Exchange the Utility CPU Card.
391, 392	0187_H, 0188_H	Out of memory on the CPC Card.	Replace CPC Card.
393	0189_H	Plugged CPC isn't compatible with the Philips CMS Patient Monitoring System.	Ensure that the correct Software is loaded on the CPC Card (check SW Part Number).
400 - 409	0190_H - 0199_H	Out of memory.	With 10MHz and/or 15MHz APP_CPU's in backplane: Check Data Management Option and SRAM board compatibility. (See Parts Lists). Replace RAM Card, if present in same cluster. Replace CPU Card in indicated slot.
			With a 40MHz CPC in backplane, replace the CPU Card in indicated slot.
410 - 419	$019A_H$ - $01A3_H$	Missing file errors.	System Configuration problem - refer to the corrective action on page 3-23.
420 - 449	$01A4_H$ - $01C1_H$	Utility CPU / EEPROM error.	System Configuration problem - refer to the corrective action on page 3-23.
500 - 699	$01F4_H$ - $02BB_H$	Indicates a Software problem that cannot be solved by hardware exchange.	Check that the installed software is a released version. Contact your local Response Center. Install released software.
700 - 799	$02BC_H$ - $031F_H$	Communication problem between two CPUs.	System Configuration problem - refer to the corrective action on page 3-23. Hardware/Software problem- refer to the corrective action on page 3-27.
800 - 899	0320_H - 0383_H	Configuration problem.	System Configuration problem - refer to the corrective action on page 3-23.

Table 3-4 Error Code Listing for Device ID 16400 (or 4010H)

Status Log Errors	Start-up Errors	Possible Cause	Corrective Action
900 - 914	0384_H - 0392_H	Something within the System memory has changed unexpectedly. This is usually caused by a RAM problem. One or more pins on a Function Card may be bent.	RAM problem- - refer to the corrective action on page 3-27. Remove and replace the affected Function Card.
915	0393_H	One of the CPUs has failed to send a test message to the next CPU. The reported slot code will not identify the defective CPU Card.	Swap/replace APP_CPU's one by one until the faulty card is found. Replace faulty card.
916 - 919	0394_H - 0397_H	Something within memory has changed unexpectedly (see error range 900-914).	RAM problem- - refer to the corrective action on page 3-27.
920	0398_H	Indicates a missing 32 ms interrupt on the CPU in the reported slot. This could be caused by a poor connection (CPU, backplane, etc.) or a failure on the Util CPU.	Inspect backplane connectors. Swap/replace APP_CPU Card in given slot. Swap/Replace UTIL_CPU Card.
921 - 999	0399_H - $03E7_H$	Something within memory has changed unexpectedly (see error range 900-914).	RAM problem- - refer to the corrective action on page 3-27.
1000 - 1031	$03E8_H$ - 0407_H	Missing mandatory card in slot indicated.	Consult the Error Code Chart in Table 3-3 on page 3-18 to determine the slot of the misplaced CPU Card - place the CPU Card in the correct slot. Check backplane in Table 1-10 Function Card Placement on page 1-23 for correct Function Card placement. System Configuration problem - refer to the corrective action on page 3-23.
1032 - 1063	0407_H - 0427_H	Wrong boot firmware revision on APP_CPU in slot indicated.	
1064 - 1095	0428_H - 0447_H	Insufficient MPB RAM on CPU in slot indicated.	Hardware/Software problem- refer to the corrective action on page 3-27. Consult the Error Code Chart in Table 3-3 on page 3-18 to determine the slot of the defective CPU Card. Exchange the defective card.
1096 - 1127	$0448H_H$ - 0467_H	No Extended Test result due to Hardware problem.	
1128 - 1159	0468_H - 0487_H	Extended Test failed.	Consult the Error Code Chart in Table 3-3 on page 3-18 to determine the slot of the defective CPU Card. Exchange the defective card.

Table 3-4 Error Code Listing for Device ID 16400 (or 4010H)

Status Log Errors	Start-up Errors	Possible Cause	Corrective Action
1160 - 1191	0488_H - $04A7_H$	RAM Card size not compatible with backplane configuration.	Ensure the correct RAM Card is installed in the backplane, and check backplane on Table 1-10 Function Card Placement on page 1-23 for correct Function Card placement. Consult the Error Code Chart on page 3-18 to determine the slot of the defective CPU Card. Exchange the cards in cluster one by one.
1192 - 1223	$04A8_H$- $04C7_H$	EEPROM configuration of the card in the slot indicated is not compatible to the Hardware configuration.	
1224 - 1255	$04C8_H$ - $04E7_H$	Wrong CPU type in slot indicated.	Check backplane on Table 1-10 Function Card Placement on page 1-23 for correct Function Card placement. Consult the Error Code Chart on page 3-18 to determine the slot of the defective CPU Card. Exchange the defective card.
1256 - 1287	$04E8_H$ - 0507_H	CPU is too slow in slot indicated.	
2100	0834_H	Unused card in the System (non-fatal error).	Check backplane on Table 1-10 Function Card Placement on page 1-23 for correct Function Card placement, remove unused card.
2110 - 2152	$083E_H$ - 0866_H	Unreleased Software installed (non-fatal error).	Contact your local response center - install released Software.
2160	0870_H	An extra CPU is present in indicated slot (non-fatal error).	Remove unused CPU Card in indicated slot.
2170 - 3300	$087A_H$ - $0C54_H$	Hardware problem.	With 10 and/or 15MHz APP_CPU's in backplane, replace the EPROM boards. With 40MHz CPC in backplane: 1. Replace the CPC Card. 2. Exchange the card in the indicated slot. 3. Exchange all other APP_CPUs one by one.

CMS System Hardware Configuration Problems

This section tells you how to deal with hardware configuration problems. These problems generally occur when a **function card** is placed in the wrong slot or if a function card is incompatible with the CMS configuration.

Concepts

Types of Function Cards

There are two basic types of function card: Master Cards and Local Cards.

The RS232_IF may be installed in any slot of the Computer Module as it has no connection to the Local Bus. The DC/DC Converter also has no connection to the Local Bus but must be inserted to the left of slot 21 of the Computer Module, because it may damage the system if placed in another slot.

- **Master Cards** - The master cards are those cards that have both a Central Processing Unit (CPU) and a Message Passing Bus interface (MPB_IF). These cards may also communicate with local cards (for example SRAM, EPROM and CDSPC_VIDEO) over the Local Bus. Only one of each master card type may be used in the same Computer Module, with the exception of the Application CPU and the display controllers.

- **Local Cards** - The Local Cards have no MPB_IF and can only communicate with the master card via the Local Bus within a cluster of connectors. These cards may be used on every cluster containing a master board within the Computer Module. All the Local Cards may be used more than once in the Computer Module, with the exception of the SDN_IF and the Rack_IF S-Ram, and more than one Local Card may used by a master card. Therefore, an identifier is used so the master card can tell the Local Card type and position in the cluster. This may also be used to test the board for compatibility with the master card.

Interconnections

Three types of card in the backplane interconnect. The types are as follows:

- Master Cards. These cards are connected to both the MPB and the local bus.

In addition, system interfaces and local cards may be interfaces to systems outside the CMS.

- System Interfaces. These are master cards that are connected to the MPB but have no connection to the local bus.

- Local Cards. As the name suggests, these cards are only connected to the local bus and have no MPB connection.

Rules for Card Placement

The rules governing where particular function cards may be positioned in the backplane are as follows:

- The DC/DC converter must be placed in the unnumbered slot (cluster 1).
- The Rack Interface card must be placed in slot 18.
- If required, the DSPC_Lang card must be placed in slot 3.
- If present, a 40MHz CPC card must be inserted in slot 12.
- Master Cards can only be used once within any local cluster.
- Local Cards must be located in the same cluster as their associated master card. Therefore, the following cards must be clustered as indicated:
    - SDN Interface and Rack Interface with Util_CPU
    - CDSPC_Video with CDSPC_Control
    - EPROM with an APP_CPU
    - SRAM with an APP_CPU
- The following cards, which have external connections, must be inserted in the rear of the backplane:
    - UTIL_CPU
    - RS-232 Interface
    - SDN Interface
    - HDLC Interface
    - Analog Interface
    - Display Controller

The end of this section gives the delivered configurations for the different releases of the CMS.

Procedures

The procedures for fixing CMS configuration problems vary depending upon your configuration and the type of APP_CPU or CPC you have. In general, the procedure for your configuration requires you to perform some visual checks, verify you are operating with the proper software revision for your CMS, and then perform fault isolation procedures based on the hardware configuration.

The LED behavior on the 40 MHz CPC Card is the same as the behavior on the 10 and 15 MHz Master CPU Cards.

For Monitors with 10 MHz and 15 MHz APP_CPU Cards, the APP_CPU in slot 5 of the System's backplane is the Master CPU.

For Monitors with the CPC Card (40 MHz), the card in slot 12 of the System's backplane configuration is the Master CPU.

The Master CPU reports errors in the System to the Status Log.

The reported CPU is not necessarily the defective CPU or Function Card.

❑ If the Monitor reboots continuously, examine the LEDs of the Function Cards:

Step 1 If the red LED of the Master CPU Card stays on, check if another CPU Card is plugged in the same cluster - there should be only one CPU per cluster. Otherwise exchange the CPU Card in the reported slot.

Step 2 If the red LED on the Master CPU does not stay on, refer to Table 3-5 General Error Code Listing for Other Device IDs on page 3-28 to identify the faulty card.

❑ For monitors with 10MHz or 15MHz APP_CPUs:

Step 1 Verify that the Master and Slave EPROM Cards are plugged in the correct slots, and make sure they belong to the same software release.

Step 2 Verify the correct EEPROM part number by:

- checking the number displayed in the “Monitor Revision” screen or
- using the appropriate cloning tool if the monitor is rebooting continuously or the display is blank.

Step 3 If the part number is correct, reprogram the EEPROM to the factory defaults using the appropriate cloning tool.

❑ If the preceding actions do not correct the configuration problem, try the following:

Step 1 Replace the EEPROM.

Step 2 Replace the Utility CPU.

Step 3 Replace EPROM Cards.

❑ For monitors with a 40MHz CPC (Flash EPROM):

Step 1 Verify the correct EEPROM part number by:

- checking the number displayed in the “Monitor Revision” screen or,
- using the CPC cloning tool if the monitor is rebooting continuously or the display is blank.If the part number is correct, reprogram the EEPROM to the factory defaults using the CPC programming tool.

Step 2 Reprogram the Software on the CPC Card using the CPC Programming Tool.

Step 3 If the preceding actions do not correct the problem:

- Replace the EEPROM.
- Replace the Utility CPU.
- Replace CPC Card in slot 12.

❑ For monitors with a 40MHz CPC and Daughter Card (UV-EPROM):

Step 1 Verify the correct EEPROM part number by:

- checking the number displayed in the “Monitor Revision” screen or,
- using the CPC programming tool if the monitor is rebooting continuously or the display is blank.

Step 2 If the part number is correct, reprogram the EEPROM to the factory defaults using the CPC programming tool.

Step 3 If the preceding actions do not correct the problem:

- Replace the EEPROM.
- Replace the Utility CPU.
- Replace CPC Card in slot 12 with a CPC Flash Card.

CMS System Hardware/Software Problems

This section shows you how to fix problems that are of a hardware/software nature. The procedure for fixing these types of problem depends on the type of error code received.

Procedures

- ❑ If you get an error code in the Status Log, go to the Service Mode and execute the extended test (see “Power On Modes” on page 3-44). If the test identifies a faulty card, replace it.
- ❑ If the CMS reboots continuously, replace the card in the slot identified by the start-up error message.
- ❑ Replace/swap the APP_CPU Cards (or CPC Cards if present), one by one.

Loudspeaker Test at Power On

From Release B.0, at every CMS cold or warm start the loudspeaker gives a series of test sounds in Monitoring and Demo mode. These sounds reassure you that the loudspeaker is functioning correctly. The sounds are in the following sequence:

• Yellow Alarm Sound

• Red Alarm Sound

• Yellow Alarm Sound

Each sound lasts about three seconds. During this short space of time the alarm manager functionality in terms of processing parameter alerts is disabled.

CMS System RAM Problems

This section shows you how to fix problems that occur in the CMS RAM. The procedure for fixing these types of problem depends on the type of error code received.

- ❑ If you get an error code in the Status Log, go to the Service Mode and execute the extended test. If the test identifies a faulty card, replace it.
- ❑ If the CMS reboots continuously:

  Step 1 Exchange the APP_CPU Card in the slot indicated by the start-up error message.

  Step 2 Exchange other cards in the same cluster one by one.

Error Code Lists for Other Device IDs

This table lists the general error codes for other devices. If the Device ID is not listed, then the source of the problem is not dependent on the Device ID.

Table 3-5 General Error Code Listing for Other Device IDs

Device ID	Error Codes	Possible Cause	Corrective Action
	10000 to 10999 2710_H - $2AF7_H$	Software internal warning.	This is a non-fatal error and can be ignored.
	11000 to 11999 $2AF8_H$ - $2EDF_H$	Buffered data either lost or corrupted by the APP_CPU Card. The reporting APP_CPU Card may be defective.	Continuous Rebooting: Allow the system to reboot as many times as the number of APP_CPU Cards fitted. (For a system with 5 APP_CUP cards, reboot 5 times.) If the error code recurs, replace the reporting APP_CPU. Replace the RAM Card if it is in the cluster of the reporting CPU Card. During Run-time: If occurrence is transient, ignore. If error code recurs often, perform the extended test in Service Mode. If the test identifies a faulty APP_CPU or RAM Card, replace it.
	12000 to 12999 $2EE0_H$ - $32C7_H$	EEPROM access failure.	Try to reprogram the EEPROM using the cloning tool. Replace the EEPROM on the UTIL_CPU Card. Replace probable defective UTIL_CPU Card. Find the slot code, and replace that card.
	13000 - 13999 $32C8_H$ - $36AF_H$	System internal configuration related errors. This refers to the structure of the various software modules.	The structure of the various software modules cannot be changed in the field. These error codes do not relate to the *system field configuration*.
32709 or $7FC5_H$	20120 - 20128 $4E98_H$ - $4EAD_H$	Data Transfer Module failed.	Troubleshoot Data Transfer Module.
32744 or $7FE8_H$	21035 or $522B_H$ 21107 or 5273_H 24138 or $5E4A_H$ 24088 or $5E18_H$ 24155 or $5E5B_H$	Internal time-handling problem. This error does not imply defective behavior.	Ignore.
32747 or $7FEB_H$	11200 or $2BC0_H$	Battery on the S-RAM board (M1055-66501 or M1056-66501) is low or defective. OR CPC board in slot 12 is defective (Release C and later.)	Exchange the S-RAM board or replace the battery on the S-RAM board (1420-0375). OR Exchange the CPC board in slot 12 (Release C and later.)
32747 or $7FEB_H$	3733 or $0E95_H$ 20004 or $4E24_H$ 20133 or $4EA5_H$ 24088 or $5E18_H$ 24155 or $5E5B_H$	Internal time handling problem. This error does not imply defective behavior.	Ignore.

Table 3-5 General Error Code Listing for Other Device IDs *(Continued)*

Device ID	Error Codes	Possible Cause	Corrective Action
32747 or $7FEB_H$	64026 or $FA1A_H$	Monitor reboots intermittently. Possible problem with SRAM Card.	In Service Mode, execute the extended test. If the test identifies a faulty card, replace it.
32752 or $7FF0_H$	22300 or $571C_H$	Monitor reboots intermittently. Philips-HIL connection problem.	Check connection of Philips-HIL cable and replace if necessary. Check connection of black wire between bezel and display. Replace if faulty. Check HIF board in display and replace if faulty. Check UTIL_CPU and replace if faulty.
	22400 or 5780_H	No response from display controller card (DSPC or CDSPC_CTRL).	Replace DSPC or CDSPC card.
	22401 or 5781_H	Missing or defective DSPC_Lang Card.	Insert a DSPC_Lang Card if missing from the backplane. Replace the defective DSPC_Lang Card.
32753 or $7FF1_H$	20300 or $4F4C_H$	Rack_IF communication problem.	Check Rack_IF connection. Replace Rack_IF Card. Check pins on backplane - replace the backplane if necessary.
	50497 or $C541_H$	SDN communication problem or temporary SCC power failure.	Check SDN connection - restart the monitor after reconnecting. Check/exchange SDN cable. Check/exchange SDN_IF Card. Check pins on backplane - replace the backplane if necessary.
32766 or $7FFE_H$	3212 or $0C8C_H$	Out of memory.	Check Data Management Option and SRAM board compatibility. Replace RAM Card, if present in same cluster. Replace CPU Card in indicated slot.
32767 or $7FFF_H$	90 or $005A_H$	Internal Software problem.	Ignore.

Error Code List for Specific Device IDs other than 16400 (4010H)

The following table lists error codes with specific Device IDs other than 16400 (4010H). The source of the fault, and meaning of the error codes listed can only be determined by the identification of the error code's specific Device ID.

If the system reboots every 4 minutes, check the HIL cable connection before troubleshooting the System.

Table 3-6 Error Code List for Specific Device IDs other than 16400 (4010H)

Device ID	Error Code	Possible cause - Fault	Corrective Action
1897 (2005_H)	18995 ($4A33_H$)	SDN communication problem. (Could be caused by temporary SCC power Failure).	1. Check SDN connection - Restart the monitor after reconnecting. 2. Check/exchange SDN_IF cable. 3. Check/exchange SDN_IF card. 4. Check pins on backplane - replace the backplane if necessary.
8199 (2007_H) 8200 (2008_H)	2049 (0801_H)	DSPC Video Card missing.	1. Check Function card placement in backplane. 2. Insert a DSPC card if missing.
		Old Display Controller Cards used with release B.0 Software	1. Check if the Software version used is B.0. 2. Check if the Display Controller Card has one of the following part numbers: M1066-66501 or M1072-66521. If so, proceed with the following steps: 3. For a Monochrome Display, replace the old Display Controller Card M1066-66501 with the new version M1066-66531. 4. For a Color Display, replace the old Display Controller Card M1072-66521 together with the Video Board M1072-66501 with the new version M1072-66531.
8203 ($200B_H$)	1, 20 (0001_H, 0014_H)	Overload on the RS-232 board due to accessing/sending too much data using the protocol with a remote computer.	Verify the external program against interface/ RS-232 bandwidth limitations. Refer to RS-232 Computer Interface Programming Guide.
8203 ($200B_H$)	6 (0006_H)	RS-232 F/W problem (large OTP).	Replace the large F/W OTP on the RS-232 card.
8203 ($200B_H$)	7 (0007_H)	RS-232 F/W problem (small OTP).	Replace the small F/W OTP on the RS-232 card.
17000 (4268_H)	46146 ($B442_H$)	Non-fatal error reported by the recorder module.	1. Ensure that there is paper in the module. 2. Ensure that the recorder module door is firmly shut.

Table 3-6 Error Code List for Specific Device IDs other than 16400 (4010H)

Device ID	Error Code	Possible cause - Fault	Corrective Action
17099 ($42CB_H$)	29113 ($71B9_H$)	Overload of the RS-232 board due to accessing/sending too much data using the protocol with a remote computer.	Verify the external program against interface RS-232 bandwidth limitations. Refer to the RS-232 Computer Interface Programming Guide.
32744 ($7FE8_H$)	21035 ($522B_H$) 21107 (5273_H) 24138 ($5E4A_H$) 24088 ($5E18_H$) 24155 ($5E5B_H$)	Internal time handling problem. This error does not imply defective behavior.	Ignore.
32747 ($7FEB_H$)	11200 ($2BC0_H$) 13561 ($34F9_H$)	Battery on S-RAM board (M1055-66501 or M1056-66501) is low or defective. OR CPC board in slot 12 may be defective (Release C or later).	Exchange the S-RAM board or replace the battery on the S-RAM board (1420-0375). OR Exchange CPC board in slot 12 (Release C or later).
32747 ($7FEB_H$)	3733 ($0E95_H$) 20004 ($4E24_H$) 20133 ($4EA5_H$) 24088 ($5E18_H$) 24155 ($5E5B_H$)	Internal time handling problem. This error does not imply defective behavior.	Ignore.
32747 ($7FEB_H$)	64026 ($FA1A_H$)	Monitor reboots intermittently. Possible problem with SRAM	In Service Mode, execute the extended test. If the test identifies faulty card, replace it.
32752 ($7FF0_H$)	22300 ($571C_H$)	Monitor reboots intermittently. Philips_HIL connection problem.	1. Check connection of Philips_HIL cable and replace if necessary. 2. Check ground connection between bezel and display. Replace if necessary. 3. Check HIF board in display and replace if necessary. 4. Check UTIL_CPU and replace if necessary.
32752 ($7FF0_HV$)	22400 (5780_H)	No response from display controller card (DSPC or CDSPC_CTRL).	Replace DSPC or CDSPC card.

Table 3-6 Error Code List for Specific Device IDs other than 16400 (4010H)

Device ID	Error Code	Possible cause - Fault	Corrective Action
32752 ($7FF0_H$)	22401 (5781_H)	Missing or defective DSPC_Lang function card.	1. Insert a DSPC_Lang card if missing from the backplane. 2. Replace the defective DSPC_Lang card.
32753 ($7FF1_H$)	20300 ($4F4C_H$)	Rack_IF communication problem.	1. Check Rack_IF connection. 2. Replace Rack_IF card. 3. Check pins on backplane - replace the backplane if necessary.
32753 ($7FF1_H$)	50497 ($C541_H$)	SDN communication problem (could be caused by temporary SCC power failure).	1. Check SDN connection - Restart the monitor after reconnecting. 2. Check/exchange SDN cable. 3. Check/exchange SDN_IF card. 4. Check pins on backplane - replace the backplane if necessary.
32766 ($7FFE_H$)	3212 ($0C8C_H$)	Out of memory.	1. Check Data Management Option and SRAM board compatibility. (see Parts List) 2. Replace RAM card if present in same cluster. 3. Replace CPU card in indicated slot.
32767 ($7FFF_H$)	90 ($005A_H$)	Internal Software problem.	Ignore.

Device ID Codes for Software

The following tables lists all the available Device ID Codes, with the corresponding device. The first table is for software devices and the second table is for Computer Module or Processor ID Codes.

Table 3-7 Software Device ID Codes

Device ID Code		Software Device
Decimal	**Hexadecimal**	
16400	4010_H	CMS's Operating System
16500	4074_H	Global Information Handler
16501	4075_H	Operating Mode Handler
17000	4268_H	Strip Recorder Software
17001	4269_H	FE-Link Recorder Software
17002 - 17004	$426A_H$ - $426C_H$	Recorder Management Software
17020	$427C_H$	Analog Output
17021 - 17023	$427D_H$ - $427F_H$	VueLink
17024	4280_H	Ohmeda 7800/7810 Ventilator interface
17025	4281_H	Anesthetic Gas Module
17027	4283_H	Ohmeda 7900/Aestiva3000 Ventilator interface
17028	4284_H	Loops Application
17029	4285_H	Loops Application
17099 - 17102	$42CB_H$ - $42CE_H$	RS232 Interface Related Software
17105	42D1	Touch Calibration
18002	4652_H	CRG Software
18003	4653_H	Blood Analysis Module Software
18004	4654_H	EEG Module Software
18005	4655_H	Neonatal Event Review Application
18006	4656_H	Blood Review Application
18007	4657	BIS Module Software
32700 - 32708	$7FBC_H$	Patient Data Management
32709	$7FC5_H$	Data Transfer Module Software
32710 - 32711	$7FC6_H$ - $7FC7_H$	Patient Data Management
32712	$7FC8_H$	Tabular Trends on Recorder
32713	$7FC9_H$	Printing Applications
32714	7FCA	Configuration Screen Printout
32744 - 32748	$7FE8_H$ - $7FEC_H$	Patient Data Management
32733	$7FDD_H$	SvO_2 Module Software
32734	$7FDE_H$	ST Segment Software
32735	$7FDF_H$	SpO_2 Module Software
32736	$7FE0_H$	Delta Temperature Software
32737	$7FE1_H$	Prompt/Message Management Software

Table 3-7 Software Device ID Codes

Device ID Code		Software Device
Decimal	**Hexadecimal**	
32738	$7FE2_H$	Error Management Software
32739 - 32740	$7FE3_H$ - $7FE4_H$H	Display Management Software
32741	$7FE5_H$	Date & Time Management Software
32742	$7FE6_H$	Cardiac Output Module Software
32744 - 32748	$7FE8_H$ - $7FEC_H$	Patient Data Management
32750	$7FEE_H$	Alarm Management Software
32751	$7FEF_H$	Heart Rate Management Software
32752	$7FF0_H$	Display Management Software
32753	$7FF1_H$	Front-end Management Software
32754	$7FF2_H$	Invasive Pressure Module Software
32755	$7FF3_H$	Wedge/CPP Software
32756	$7FF4_H$	NBP Module Software
32757	$7FF5_H$	Temperature Module Software
32759	$7FF7_H$	$tcpO_2$/$tcpCO_2$ Module Software
32762	$7FFA_H$	CO_2 Module Software
32763	$7FFB_H$	O_2 Module Software
32765	$7FFD_H$	ECG/RESP Module Software
32766	$7FFE_H$	SDN Management Software

Table 3-8 Processor Device ID Codes - Computer Module ID Codes

Device ID Code		Processor Device
Decimal	**Hexadecimal**	
8193	2001_H	Real-time Clock (on Util_CPU Card)
8194	2002_H	EEPROM (on Util_CPU Card)
8195	2003_H	Alarm Relay (on Util_CPU Card)
8196	2004_H	Philips HIL Controller (on Util_CPU Card)
8197	2005_H	SDN Interface (on Util_CPU Card)
8198	2006_H	FE-Link (on Util_CPU Card)
8199	2007_H	DSPC Card
8200	2008_H	Color DSPC Card
8202	$200A_H$	Application CPU Card
8203	$200B_H$	RS-232 Interface Card
8204	$200C_H$	HDLC Interface Card
8205	$200D_H$	Analog Interface Card

Troubleshooting Module 3 - Fixing Recorder Problems

The CMS uses the M1116A and M1116B Recorder Modules to make hard-copy recordings of the patient data which is displayed on the screen. The method for troubleshooting is the same for either recorder: identify the physical or functional problem, then find it in the accompanying table and follow the corrective action that is recommended.

Symptom	Possible Cause	Corrective Action
System thinks that door is open when it is not.	Module out of paper. Defective door switch.	Insert new paper roll. Replace door switch. Exchange module.
System thinks that the recorder is out of paper when it is not.	Paper-out sensor dirty.	Clean paper-out sensor.
Recorder not communicating with System.	Poor connection to the front-end rack. Only one recorder module may be used with each monitor. System not configured properly. Too many modules connected.	Unplug the module. Plug it back in and try it again in a few seconds. (Watch for the LED to flash.) Remove one of the recorder modules. Check the configuration of the connected monitor. Check and remove the extra modules.
Recorder won't run.	Recorder interface not working correctly.	Unplug the module. Plug it back in and try it again in a few seconds. (Watch for the LED to flash.)
Poor print quality.	Printhead dirty. Printhead failure.	Clean the Printhead as described in “Cleaning the Recorder Module” on page 2-26 of this manual. Exchange the module.
Paper not feeding properly.	Paper roll off center. Dirty roller.	Center paper roll on roller guides. Clean roller.
Module does not lock into rack.	Locking plates defective.	Remove and exchange the locking plates.

Troubleshooting Module 4 - Fixing Handheld Keypad Problems

This module shows you how to troubleshoot problems based on symptoms given by a faulty Handheld Keypad. Use this module when your CMS Handheld Keypad is not functioning correctly or if you are referred to this module from another procedure.

All CMS 2000 models come with a Handheld Keypad. The Handheld Keypad is used to interact with the drug calculator and patient data management. Except for the option of an XGA-compatible main display, it is connected to the Main Display through the human interface connector. With the XGA-compatible display option, the Handheld Keypad is connected to the External Alarm Device which is connected to the Computer Module (HIL connector).

Symptom	Possible Cause	Corrective Action
Keypad not communicating with system.	HIL cable reversed.	Reconnect the HIL cable, making sure that the dot indicators match.
	Keypad cable loose or defective.	Check keypad cable. Exchange keypad if necessary.
Keypad generates system reset and erroneous error code in the system log.	Loose connection between logic board and switch board.	Check connection.
	Keypad defective.	Replace Keypad.
Some keys or LEDs not functioning.	Keys or LEDs not active in current screen.	Use keypad specification test to test the keys in the proper screen.
	Loose connection between the logic board and switch board.	Check connection.
	Keypad defective.	Replace Keypad.
	Overlay not correctly aligned.	Upgrade to a new interface.

Troubleshooting Module 5 - Fixing Printing Problems

External printers can be connected to the CMS through the RS-232 Connector. This module shows you how to troubleshoot problems based on symptoms given by a printer. Use this module if your printer is causing a malfunction of the CMS or if you are referred to this module from another procedure.

Table 3-9 Troubleshooting the External Printer

Symptom	Possible Cause	Corrective Action
"No Printer Available" or "Printer Malfunction" status message.	Printer not connected to monitor or central station.	Check printer interface cable.
	Printer out of paper.	Check paper.
	Printer off.	Check printer power cord and switch.
	Printer configured incorrectly.	Check printer settings.
	Wrong printer set-up in Configuration Mode.	Check printer configuration settings in Configuration Mode (under Trends/Calc or Patient Data).
	Printer malfunction.	Consult service manual supplied with printer.
	RS-232 Interface Card defective.	Exchange RS-232 Interface Card.

Local Jet Printer Configurations

While color HP DeskJet printers are compatible with the CMS, color printouts are not supported. Some printers require the following switch settings in order to be used with the CMS.

Table 3-10 Printer Switch Settings

HP QuietJet Printer	The switches used to set the configuration are arranged in two banks of eight. Switch positions required to print locally are:
	`  1  2  3  4  5  6  7  8`
	`A DN Up DN DN DN DN DN DN`
	`B DN Up DN DN DN Up DN DN`

HP DeskJet Printers
 	
HP Desk Jet 500
	The switches used to set the configuration are arranged in two banks of eight. Switch positions required to print locally are:
	`  1  2  3  4  5  6  7  8`
	`A DN DN DN Up DN DN DN DN`
	`B DN Up DN DN Up DN DN Up`

Table 3-10 Printer Switch Settings

HP DeskJet 550C	The switches used to set the configuration are arranged in two banks of eight. Switch positions required to print locally are:
	
	`   1  2  3  4  5  6  7  8`
	`A  DN DN DN Up DN DN DN DN`
	`B  DN Up DN DN DN Up DN DN`
	
	For Bank A, switch 6 varies depending upon the paper size:
	Up: A4 (metric) DN: Letter size (US Format)
	Note that HP DeskJet 400 and 600 configure internally.

HP ThinkJet Printer	The switches used to set the configuration are on the rear. Switch positions required to print locally are:
	
	`   1  2  3  4  5  6  7  8`
	`A  DN DN DN DN DN DN DN DN`
	`B  Up DN DN DN Up -- -- --`

HP LaserJet Printers	Switch positions required to print locally are:
	
	`   1   2   3   4   5   6   7  8`
	`S1 Off On  On  Off Off Off On On`
	`S2 all off`
	`S3 all off`
	`S4 all off`

HP LaserJet II/III/IV/ V/VI Printers	Set the printer off line and enter the configuration menu by pressing the MENU key and holding it down until SYM SET =ROMAN-8* is displayed. Step through the menu items by pressing the MENU key. The items are set as follows: SYM SET=ROMAN-8 AUTO CONT=OFF I/O=SERIAL BAUD RATE=19200 ROBUST XON=ON DTR POLARITY=HI Press + or - to alter the item settings. Press ENTER RESET MENU to store the new setting. (The "*" indicates that the setting is saved.) Set the printer on line when configuration is completed.
HP 2673A Printer	The configuration for printing locally to a Philips 2673A Printer is as follows: BAUD RATE: 19200 PARITY: NONE HANDSHAKES: XON/XOFF HARDWARE DATA BITS: 8 STOP BITS: 1 STRIP NULL/DEL: OFF

Troubleshooting Module 6 - Using the Service Mode

This section gives you details on how to use the functions of the service mode to check the operation of the CMS and to test specific functions. This section includes a description of the power on modes.

Accessing & Leaving Service Mode

The Service Mode of the CMS is entered and exited using the following instructions.

Note: From Rel. C.0, returning to monitoring mode is allowed without entering a password. Just press [Monitor Setup] followed by [Resume Monitor].

Table 3-11 Changing Operating Modes

Step	Action	Comment
1	Press [Monitor Setup] (or [Instrument Config]).	The monitor setup or instrument configuration selection window is displayed.
2	Press More Choices if available.	Shows additional choices for softkeys in this selection window.
3	Press Operating Modes softkey.	The Operating Mode task window displays the current operating mode in words (for example, “Operating Mode - Monitoring”) and prompts for the password.
4	Enter the password. Service Mode: 4311	Use the keys labeled 1 to 5. If the password is correct, then the Change OpMode softkey is highlighted. If the password is incorrect, the system returns to the Standard Display.
5	Press Change OpMode softkey.	The Operating Mode task window displays both Monitor and Config in reverse video, with the current operating mode highlighted.
6	Select the required Service Mode.	Use the arrow keys or press the Change Opmode softkey.
7	Press [Confirm].	The system performs a cold-start and switches operating modes.
8	Press [Monitor Setup] or [Instrument Config].	Displays the Service Mode task window.

NOTE When Service Mode is entered or left, all monitor settings are reset to the user defaults and the database is cleared.
In the Service Mode, the display becomes blank and the message “Service Mode active - NO MONITORING!” appears at the top of the screen.

Facilities Available in the Service Mode

The following facilities are available in Service Mode and are described in the following paragraphs:

- Global Switches including Line Frequency, Settings Transfer and Altitude (applicable to software Release C and later releases) and French Homologation (applicable to software Releases A and B only)
- Date & Time
- Status Log
- Monitor Revision
- Power On Modes
- Display alignment patterns
- Network Test

Changing the Global Switches

The Global Switches facility can be used to change the global configuration of the system. The global configuration is the same for all configuration sets.

To enter the Global Switches task window:

Step 1 Press the Monitor Setup (or Instrument Config) hardkey.

Step 2 Press the Global Switches softkey.

Step 3 Change the global configuration of the system as required.

Line Frequency

The line frequency is used to switch between 50 Hz and 60 Hz for the ECG filtering frequency.

CAUTION **Ensure that the Line Frequency is set correctly for the country option ordered. The factory default is 60 Hz for all units.**

Control Panel Software

A global switch is used to load software that is compatible with the Control Panel (Standard or Classic).

Step 1 Press the Monitor Setup (or Instrument Config) hard key.

Step 2 Press the Global Switches softkey.

Step 3 For the Standard keypad *without* Help key, the text should read: <Help>key: No. For the Classic keypad *with* Help key, the text should read: <Help>key:Yes. (Note: The Classic keypad is not available with Release B.0 or later.)

Settings Transfer

The patient-related settings of each parameter module can be stored in the EEPROM of the modules. During monitoring, changes in the active settings are recognized and saved. This allows the module to retain all settings, even if transported from one system to another. The Settings Transfer feature can be configured to “Yes” or “No”.

The parameter module stores its settings in the EEPROM until they are changed, either by modifying them in the parameter task window, or by resetting all parameter settings to user-configured default values while in Monitoring Mode. All parameter settings are reset to the user defaults when doing one of the following:

- Changing Operating Mode by pressing Monitor Setup (or Instrument Config), then Global Switches, More Choices, and then the Operating Modes softkey.
- Changing the Configuration Set by pressing Monitor Setup (or Instrument Config), and then the Config Sets or Adult/Pedi/Neo softkey.

NOTE Both actions result in a “Restart”, in which the instrument is rebooted and the user default settings of the parameter module are stored in the EEPROM of the module.

The following types of modules support Settings Transfer:

- All modules with **T** marked on the front panel
- The Pressure, CO, CO_2 and Temperature Modules (also without the **T** mark)

The Heart and ST applications have settings stored in the ECG and ECG/RESP modules respectively.

The Philips Monitor retains the labels of the multiple parameters, such as Temperature or Pressure. The identity labels such as ABP, PAP, Temp 1, and Temp 2, are transferred when the module is positioned in any slot on the same or other system. This Label Tracking feature is only active if Settings Transfer is set to Yes.

The parameter application software stores a label identifier. This allows the system to match the stored label with the parameters’ set default label.

Setting the Altitude

An adjustment for altitude must be entered before using the CO_2, AGM, and $tcpO_2/CO_2$ Modules. This is because the algorithm adjusts the measurement according to altitude. The altitude setting is made in the Global Switches task window.

Setting the Date and Time

This facility allows you to set the system date and time. If the equipment is connected to the SDN Network, the date and time are set automatically by the Network.

Set the date and time as follows:

Step 1 Press Monitor Setup (or Instrument Config).

Step 2 Press Date & Time .

Step 3 Enter the new date and time.

French Homologation (French language CMS only)

There is no option to configure the system to meet French Homologation requirements for software Release C, D or E. French Homologation is achieved in these releases by using specific French Homologation software.

An option to configure the system to meet French Homologation requirements is available for software Release A, B, F and later releases. The French Homologation setting (ON or OFF) is the same for all configuration sets.
The default setting is: “Fr. Hom. Behavior: NO”

Displaying the Status Log

The Status Log contains error messages reported by the monitor either during the boot process or during operation. This information can be accessed in either Monitoring Mode or Service Mode. The Service Mode Status Log displays both fatal and non-fatal error codes. The Monitoring Mode Status Log displays fatal error codes only.

RS-232 Interface

Any RS232 configuration alterations made in Service Mode will affect the configuration settings made in Configuration Mode.

An external personal computer can be connected to the CMS via the RS-232 connector. Refer to the *RS-232 Computer Interface Programming Guide* for a comprehensive description of the capabilities of the interface.

The RS-232 Task Window is available to allow you to perform the RS-232 Loopback test. Refer to Maintaining the CMS, Specification Tests, in this manual for a full description of this test.

Checking the Hardware and Software Revisions

The System has a revision log facility which provides information on the revision status of the hardware and software. These revision screens can be accessed in all operating modes.

The following information is contained in the header of the Monitor Revision Task Window:

- EEPROM Number: (for example: M1059-85781)
- Serial Number: (for example: 2916A02425)

Displaying the Software or Hardware Revision

Step 1 Press Monitor Setup (or Instrument Config).

Step 2 Press Monitor Revision.

Step 3 Press the key corresponding to the required revision screen. (Show SW Rev or Show HW Rev).

Hardware Revision

- Subsystem (for example, System)
- Part Number (hardware – for example, M1085-66501)
- Firmware Revision (for example, 6)

Software Revision

The software revision screen lists the contents of the EPROM Cards as follows:

For each EPROM Card

- Slot Number
- EPROM Package
- Part Number (software)

Power On Modes

The power on modes are provided for service purposes only. They do not influence the monitoring power on behavior, which is not configurable.

This facility enables the service engineer to perform a power on reset of the system. Use the Power On facility as follows:

Step 1 Press Monitor Setup (or Instrument Config).

Step 2 Press **Power On Modes**.

Step 3 Type in the service password. The **Change Op Mode** key is highlighted if the password is entered correctly.

Step 4 Press **Change Op Mode**.

Step 5 Select Cold, Warm, Hot or Ext Test and press **Confirm**.

Overview of the Power On Modes

The type of Power On Mode executed depends on the system down-time or the detection of a fatal error by the operating system:

System Down Time	Power On Mode
< 1 minute	Hot Start - patient data and *active* user settings are recovered on restart.
≤ 3 hours	Warm Start - patient data is recovered. Default configurations are restored.
> 3 hours	Cold Start - patient data is lost. Default configurations are restored. System performs extended test.

Display Alignment Patterns

This facility enables the service engineer to check whether the display patterns are in any way distorted. Use the Display Alignment Patterns facility as follows:

Step 1 Press Monitor Setup (or Instrument Config).

Step 2 Press any of the softkeys to display varying patterns on the screen.

Network Test

The test provides information about every SDN Device which is connected to the network. To start the Network Test, press the Other Patient (or Overview) hardkey, then press the softkey marked Network Test.

The Network Test information is presented on the screen in tabular format. The devices on each connected branch of the network are detailed in the table rows. Up to 15 rows of information are displayed at one time.

Use the Scroll Page and Next Page softkeys to scroll through the table, highlighting the items in the table. An example of the information displayed for one branch of the Network is provided below.

Table 3-12 Example of the Network Information

LBN	UNIT		REL	ERR	STATUS
03	CMS/24	0	X2	00	SDN, ON, NET, ST
	PIC6M	6 R	X2	00	SDN, ON, NET
	PIC6M	6 C	X2	00	SDN, ON, NET

Column: LBN

Lists the Branch Numbers to which each of the devices are connected. Central stations are always shown at Branch 0, even if they are connected to, for example, Branch 31.

Column: UNIT

Lists codes for the names of each device on each branch of the network. The codes, and the devices to which they refer, are as follows:

CARPO 78580A

CLOVER 78534 Patient Monitor

CMS/24 CMS Patient Monitoring System

COMP1 Computer

COMP2 Computer

COMP3 Computer

COMP4 Computer

DIAG Diagnostic computer

MINI 783XX Series Patient Monitors

PIC4C	Patient Information Center (4-Bed Computer)
PIC4M	78504 Patient Information Center (4-Bed Monitoring) M2350/60 Philips Component Central Monitor
PIC6M	78560 Patient Information Center (6-Bed Monitoring) M2350/60 Philips Component Central Monitor
PIC8C	Patient Information Center (8-Bed Computer)
PIC8M	78508 Patient Information Center (8-Bed Monitoring) M2350/60 Philips Component Central Monitor
POGO	78532 Patient Monitor
REC_D	Dedicated Recorder
REC_S	Shared Recorder (at Central Station)
TELEM	Telemetry
PIC, AIC or VIC	Philips Information Center
?????	Unknown (new) device

NOTE Each UNIT code is followed by a number. This number is a private subcode, used for internal purposes on the central station (Patient Information Center). It is not significant for service purposes.

Additional lines are displayed below the device line when a device is assigned to a central station (as in the previous example). This does not signify that the central station is physically connected to the same branch as the device.

When a device is assigned to a central station, the letter “C” or “R” is displayed between the UNIT and REL columns for the central station.

- A C indicates that the device is also assigned to an arrhythmia system.
- An R indicates that recordings can be made at the central station.

Column: REL

Displays the protocol release of each device on each branch.

Column: ERR

Lists hexadecimal error codes for each device on the network. If the code is "00", no errors are present. Otherwise, interpret the error codes as follows:

Step 1 Convert the two-digit hexadecimal error code to an eight-digit binary code.

Step 2 Compare the resulting binary code with the error code chart below. Note the extreme left digit of the binary code is digit number "7", the second from the left is number "6", and so on. Each "1" in the binary code corresponds to an error.

Table 3-13 Error Code Chart

Digits								Error Indicated
7	6	5	4	3	2	1	0	
1	.	.	.	.	.	.	.	False SPS Event Flag
	1	.	.	.	.	.	.	Fatal Control Error Flag
		1	.	.	.	.	.	Recoverable Control Flag Error
			1	.	.	.	.	Physical Data Error Flag
				1	.	.	.	Logical Data Error Flag
					1	.	.	Poll Cycle Overflow Flag
						1	.	Command Response Fail Flag
							1	System Cycle Failure Flag

Column: STATUS

This column provides information about the SDN state of each device. An example status line would be:

SDN, ON, NET, T

Which can be interpreted as follows:

SDN Device is connected to the SDN Network.

NET Network is active.

ON Device is on-line.

T Test Mode is active.

If the device has only just been connected to the network, or has only just been powered-up, the letters "ST" (for "START") are also displayed.

Description of the Boot Process

Overview

The boot process takes place in the following four stages:

1.Hardware self test.

2.File transfer.

3.Software initialization - phase 1.

4.Software initialization - phase 2.

When all tests are successful and no hardware failures are detected, the boot process lasts between 12 and 15 seconds before ECG monitoring can begin. These tests are described in detail in the following subsections.

All start modes of the system (hot, warm, and cold starts) follow these four stages. Only the status of the system at the last power down, and the time elapsed before the system is powered on again, determine the start mode. In all start modes the ECG parameter screen is displayed 12–15 seconds after the start-up is requested.

The actions performed in each start mode also differ in the extent to which the system components are tested. For example, a cold start runs more extensive memory tests than warm or hot starts.

An extended test can be activated in the Service Mode to run an extensive test of the Monitor. When selected, the extended test takes over the system after the hardware configuration has been determined in Stage 2 of the boot process.

Stage 1: Hardware Self-Tests

During the first stage of the boot process all boards in the computer module run their self-tests. The success of the tests is indicated by the red LEDs on the System Boards.

At the start of the self test, the red LEDs are lit for 1 second, and then the SDN LED is turned off and the other two LEDs blink during normal operation.

Immediately following this stage, the system checks whether an external tool is connected, for example, a cloning tool. If an external tool is detected, then it is given full control of the self-tested system hardware; none of the system software is activated.

Stage 2: File Transfer and System Configuration

Four to six seconds after the boot request, information about the system board configuration is read from the central EEPROM. This information indicates what software must be present, and identifies which boards are mandatory and which are optional.

Stage 3: Software Initialization -- Phase 1

In the first software initialization phase, each software module initializes its buffers. A check of the local buffer data is also made. If a hot start is made, the data should be correct in the local buffer on the CPU.

Any problems are reported to the Status Log. If software on one Application CPU reports a problem, the operating system will try to clear this buffered data by rebooting. This will usually solve all problems.

Stage 4: Software Initialization -- Phase 2

At this stage the different parts of the software check whether other optional hardware or software is available in that particular system.

After the second software initialization phase, the Monitoring Mode is activated.

Summary of the Power On Modes

The type of Power On selected by the CMS depends on the down-time of the unit as follows:

System Down Time	Start Mode
< 1 minute	Hot Start.
< 3 hours	Warm Start.
> 3 hours	Cold Start.
NA	Extended Start can only be selected in the Service Mode.
NA	X-Start (occurs when changing operating Modes and configuration sets).

Hot Start

The Monitor makes a hot start when it has been powered down for a period less than one minute. The active user default values, including parameter module settings are recovered and retained on restart.

Warm Start

During a warm start the System behaves as during a cold start, but an abbreviated version of the self-test is carried out. The system database for patient data management is checked and recovered. All active settings are lost.

Cold Start

CAUTION **During a cold start the CPU Cards run a detailed test of memory which erases the system database for patient data management. All active settings and patient data are lost.**

All user default values for configurable items including parameter module settings are restored and an extensive self-test is carried out.

When Settings Transfer is configured to ON, patient-related settings are recovered from the module front-end's non-volatile memory. The system database for patient data management is cleared. Leaving the Demo Mode causes a cold start.

A cold start usually requires between 12 and 15 seconds before the Monitoring Mode is activated.

Extended Test

CAUTION **During the extended self-test the CPU Cards run a detailed memory test that erases the system database for patient data management. All patient data is lost as the memory test is equivalent to a cold start.**

This test is not performed during the standard boot process but is a software switch that can be selected in the Service Mode.

When all components are tested successfully, the extended test takes between 2 and 2.5 minutes to complete, and the upper limit is 255 seconds. An error message is directly displayed at the top of the screen when problems occur during the Extended test. After the test, inspect the Status Log for any device IDs and error codes generated.

X-Start

During an X-start, the system reacts as after a cold start, the only difference being that the user default settings of the Monitor are downloaded to the EEPROM of the modules. An X-start occurs after changing operating mode or configuration set.

NOTE Modules that are plugged in the System within 30 seconds after an “X- Start” is initiated, will receive the user default settings of the Philips Monitor.
Modules that are plugged in 30 Seconds after an X-Start is initiated will transfer the stored patient settings to the Philips CMS Patient Monitoring System.

Chapter 4 Troubleshooting the Plug-in Modules

This chapter tells you how to troubleshoot problems that come from faults within the plug-in modules or the associated circuitry within the rest of the CMS. The modules use visual indications, error messages, and INOP messages to indicate a fault. All references to the CMS also refer to the ACMS unless specifically stated.

See “Procedure Overview” on page 4-2 for a more detailed overview.

Objectives

This chapter shows you how to:

- Recognize a properly operating Plug-in Module.
- Identify symptoms of improper operation of the Plug-in Modules.
- Use any symptoms or indications to identify a fault as being in the Plug-in Modules.
- Further isolate faults down to field-replaceable assemblies.

Concepts

This chapter uses visual indications, Inops, error messages and other operational symptoms to help you diagnose problems with the Philips Plug-in Modules. Symptoms have been grouped based on the measurement performed by the Plug-in Module. Each troubleshooting section contains procedures for isolating faults based on the symptoms, any supporting theory as to why you are being told to do a certain procedure, and any additional rationale that will help you to isolate faults.

- **Inops** – Inops are messages displayed on the screen when the CMS cannot measure or process signals properly. This could be due to patient-related or equipment-related problems. This section deals only with those Inops which are equipment related.
- **Task Window** – The task window is an operating level of the CMS which allows you to make changes or adjustments to the parameters or screen displays, or to perform procedures. Each parameter has a series of task windows which can be accessed by pressing the setup key on the parameter module. This section uses the task windows for each parameter to check for error messages.

Procedure Overview

Table 4-1 Troubleshooting and Self-Test Procedures

Topic	Page
Troubleshooting $tcpO_2$/$tcpCO_2$ Problems	4-3
Troubleshooting ECG and ECG/RESP Problems	4-9
Troubleshooting Pressure Problems	4-11
Troubleshooting NBP Problems	4-13
Troubleshooting Cardiac Output Problems	4-17
Troubleshooting SpO_2/Pleth Problems	4-22
Troubleshooting SvO_2 Problems	4-24
Troubleshooting FIO_2 Module Problems	4-28
Troubleshooting Temperature Module Problems	4-30
Troubleshooting CO_2 Module Problems	4-32
Troubleshooting Blood Analysis Module Problems	4-35
Troubleshooting EEG Module Problems	4-40
Troubleshooting BIS Module Problems	4-43
Troubleshooting VueLink Module Problems	4-52
"Self-Test Procedure Overview"	4-55
"Performing the ECG or ECG/RESP Module Self-Test"	4-57
"Performing the M1006A/B Pressure Module Self-Test"	4-57
"Performing the NBP Module Self-Test"	4-58
"Performing the SpO_2/Pleth Module Self-Test"	4-58
"Performing the Cardiac Output Module Self-Test"	4-59
"Performing the $tcpO_2$/$tcpCO_2$ Module Self-Test"	4-59
"Performing the SvO_2 Module Self-Test"	4-60
"Performing the SvO_2 Optical Stability Check"	4-60
"Performing the CO_2 Module Self-Test"	4-61
"Performing the Temperature Module Self-Test"	4-62
"Performing the Blood Analysis Module Self-Test"	4-62
"Performing the Recorder Module Self-Test"	4-63
"Performing the VueLink Module Self-Test"	4-63
"Performing the Data Management Database Self-Test"	4-63
"Performing the RS-232 Card Loopback Test"	4-64

Troubleshooting $tcpO_2/tcpCO_2$ Problems

This section describes how to troubleshoot and correct faults associated with the $tcpO_2$/$tcpCO_2$ module. The procedures for recognizing, isolating, and correcting faults using this module are as follows:

- Identifying a problem based on visual indications or repeated INOPS.
- Checking the $tcpO_2/tcpCO_2$ task window for specific error messages and performing the corrective actions suggested in the table given with this module.
- Calibrating the module as required.

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the $tcpO_2/tcpCO_2$ module, perform the following actions:

Step 1 Make sure there is a transducer connected to the module. If no transducer is connected, connect one.

Step 2 Make sure the $tcpO_2/tcpCO_2$ parameter is turned on. Turn it on, if it is not.

Step 3 Make sure the $tcpO_2/tcpCO_2$ numeric is turned on. Turn it on, if it is not.

Step 4 Make sure you don't have more than one $tcpO_2/tcpCO_2$ module plugged into the module racks you are using. If more than one $tcpO_2/tcpCO_2$ module is plugged in, the supernumerary modules are ignored and should be removed.

Step 5 Check the connection on the module and the rack interface.

1. Unplug and re-plug the $tcpO_2/tcpCO_2$ module and check if the green LED on the $tcpO_2/tcpCO_2$ module lights up after re-plugging. If it does not, proceed with the following:
2. Put the $tcpO_2/tcpCO_2$ module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:

3. *Note: this procedure applies only for setups, in which the $tcpO_2/tcpCO_2$ module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the $tcpO_2/tcpCO_2$ module and check if the LED lights up. If it does not, proceed with the following:
4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the $tcpO_2$/$tcpCO_2$ module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:
5. Replace the rack and plug in the $tcpO_2/tcpCO_2$ module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and one or more INOP messages are displayed for the $tcpO_2/tcpCO_2$ module, perform the following actions:

Please note that for proceeding to the next steps a transducer must be connected to the module.

Step 1 Perform a module self-test (See "Performing the $tcpO_2/tcpCO_2$ Module Self-Test" on page 4-59). If the $tcpO_2$ test numeric reads exactly 60 mmHg (8.0 kPa) and the tcpCO2 test numeric reads exactly 40 mmHg (5.3 kPa), proceed to the next step, if not, replace the module.

Step 2 Enter the $tcpO_2/tcpCO_2$ Task Window by pressing the setup key on the $tcpO_2/tcpCO_2$ module. The Task Window displays messages dealing with the $tcpO_2/tcpCO_2$ module failures. The following table describes the messages and corrective actions to take.

Table 4-2 Task Window messages for the $tcpO_2$/$tcpCO_2$ Module

Message	Possible Cause	Corrective Action
TC Equip Malf, with prompt: module malfunction.	Module is faulty.	Unplug then re-plug the Module. if the error prompt reappears within 10 seconds, exchange the Module.
	Transducer has been inserted and removed into/from calibration chamber too frequently.	Unplug, then re-plug the module.
	Microswitch in Calibration chamber is intermittent.	Unplug and re-plug the module. If the error prompt reappears any time after 10 seconds, replace the Calibration chamber.
TC Equip Malf, with prompt: equipment malfunction. The transducer is plugged in.	Polarization voltage or transducer supply voltage is out of range.	Disconnect the transducer. If the prompt changes to module malfunction, exchange the module. Otherwise replace the transducer.
	Heating malfunction in the transducer.	Swap transducers to verify prompt message. If necessary, replace transducer.
	Heating control in module is defective.	Swap transducers to verify prompt message. If necessary, exchange module.
No numeric values, and no -?- in standard display when transducer is plugged in, but not inserted in the Calibration chamber.	Microswitch in Calibration chamber is faulty.	Replace the Calibration chamber.
Prompt: insert transducer in chamber appears when the transducer is in the chamber and the calibration is started.	Microswitch in Calibration chamber is faulty.	Replace the Calibration chamber.
Calibration has passed, but readings fluctuate more than 2.0 mmHg (0.3kPa)/30 seconds.	Membrane/electrolyte worn out.	Re-membrane the transducer and restart the calibration. If the values still fluctuate more than 2.0 mmHg (0.3kPa)/30 seconds, replace the transducer.

Step 3 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears.

Table 4-3 INOP Messages for the $tcpO_2$/$tcpCO_2$ Module

INOP Message	Possible Cause	Corrective Action
tc UN-PLUGGED	Parameter is ON and unplugged from rack.	Perform Step 5 on page 4-3.
tc EQUIP MALF	Malfunction in the transducer or the module.	Refer to the related Task Window messages in Table 4-2 on page 4-5.
tc NO TRANSDUC	No transducer is connected to the module.	Connect transducer to module.
tc CHANGE SITE	The site timer in the module has expired.	Change application site and restart timer.
tc CAL FAILED	Calibration failed due to out of range or unstable signal during calibration.	For more information on the calibration of the module, refer to tcpO2/tcpCO2 Module section of the *User's Reference Manual*
tc CAL REQUIRD	Calibration is required before applying the transducer to the patient.	Run a Calibration as described in tcpO2/tcpCO2 Module section of the *User's Reference Manual.* Note: if the message is still displayed after calibration, run the calibration again. If you get the same message again, replace the module.
tc CAL RUNNING	A calibration is running.	Wait until calibration is finished.
tc STABILIZING	The transducer has not yet reached the selected temperature and/or the skin is not ready to be measured.	Wait until measurement site has warmed up and values become stable.
tc CHECK TIME	Site timer due to expire in 15 minutes or less.	Change application site and restart timer.

❑ If $tcpO_2/tcpCO_2$ **readings are questionable**, perform the following actions:

Perform a $tcpO_2$ zero check and $tcpCO_2$ gain check for the transducer. These checks tell you whether the $tcpO_2/tcpCO_2$ transducer is working correctly.

Test Equipment

The following list gives you the test equipment recommended to perform the specification test on the $tcpO_2/tcpCO_2$ plug-in:

- 1 Calibration Unit (Philips 15210B or Radiometer TCC3)
- 1 Calibration gas bottle of Cal 1 gas (20.9% O_2, 5% CO_2) (see Chapter 6 "Parts List for CMS")
- 1 Calibration gas bottle of Cal 2 gas (0% O_2, 10% CO_2) (see Chapter 6 "Parts List for CMS")
- 1 Accessory Kit (15209-60010)
- 1 $tcpO_2/CO_2$ transducer (Philips M1918A or Radiometer transducer)
- 1 Calibration Tubing (M2205A)

Procedure

Step 1 Ensure correct function of the Calibration Unit (See "Gas Flow Performance Check" on page C-6 for Philips 15210B and Radiometer Service Documentation for Radiometer calibration unit TCC3).

Step 2 Make sure that you are not in Service mode.

Step 3 Set the transducer temperature to 43.0° C.

Step 4 Using a calibration unit (Philips M1918A or Radiometer calibration unit TCC3) and Cal 1 gas, calibrate the module as described in the tcpO2/tcpCO2 Module section of the *User's Reference Manual.*

Step 5 Check and note down the displayed values for $tcpO_2$ and $tcpCO_2$. The values should not fluctuate more than 2 mmHg (0.3kPa) in 30 seconds.

Step 6 If the readings fluctuate more than 2 mmHg (0.3kPa), re-membrane the transducer ensuring that the old electrolyte is thoroughly removed and check wether you need to activate the transducer. The tcpO2/tcpCO2 Module section of the *User's Reference Manual* tells you how to do this.

Step 7 Repeat steps 4 and 5. If the test fails again, the transducer has unacceptable drift and has to be replaced. Repeat steps 4 and 5 with new transducer.

Step 8 Replace the Cal 1 gas cylinder on the calibration unit with the Cal 2 gas cylinder. Turn on the gas supply of your calibration unit.

Step 9 Check the values displayed on the screen. The displayed $tcpO_2$ must be < 6 mmHg (0.8kPa) within 10 minutes. The displayed $tcpCO_2$ value must be within the range listed in the table within 10 minutes. If the $tcpO_2$ is not < 6 mmHg (0.8kPa), and/or $tcpCO_2$ values are not within the acceptance range listed in the tables given, the transducer does not measure correctly and needs to be replaced.

Table 4-4 Calibration Values

$tcpCO_2$ at CAL1 gas		Min. $tcpCO_2$ at CAL2 gas		Max. $tcpCO_2$ at CAL2 gas	
39 mmHg	5.2 kPa	74 mmHg	9.9 kPa	88 mmHg	11.7 kPa
38 mmHg	5.1 kPa	72 mmHg	9.7 kPa	86 mmHg	11.5 kPa
37 mmHg	5.0 kPa	70 mmHg	9.5 kPa	84 mmHg	11.3 kPa
36 mmHg	4.9 kPa	68 mmHg	9.3 kPa	81 mmHg	11.1 kPa
35 mmHg	4.8 kPa	66 mmHg	9.1 kPa	79 mmHg	10.8 kPa
34 mmHg	4.7 kPa	64 mmHg	8.9 kPa	77 mmHg	10.6 kPa
33 mmHg	4.6 kPa	62 mmHg	8.7 kPa	75 mmHg	10.4 kPa
32 mmHg	4.5 kPa	60 mmHg	8.5 kPa	72 mmHg	10.2 kPa
31 mmHg	4.4 kPa	59 mmHg	8.3 kPa	70 mmHg	9.9 kPa
30 mmHg	4.3 kPa	57 mmHg	8.1 kPa	68 mmHg	9.7 kPa
29 mmHg	4.2 kPa	55 mmHg	7.9 kPa	66 mmHg	9.5 kPa
28 mmHg	4.1 kPa	53 mmHg	7.7 kPa	63 mmHg	9.3 kPa
27 mmHg	4.0 kPa	51 mmHg	7.5 kPa	61 mmHg	9.1 kPa
26 mmHg	3.9 kPa	49 mmHg	7.4 kPa	59 mmHg	8.8 kPa
25 mmHg	3.8 kPa	47 mmHg	7.2 kPa	57 mmHg	8.6 kPa
24 mmHg	3.7 kPa	45 mmHg	7.0 kPa	55 mmHg	8.4 kPa
23 mmHg	3.6 kPa	43 mmHg	6.8 kPa	52 mmHg	8.2 kPa
22 mmHg	3.5 kPa	41 mmHg	6.6 kPa	50 mmHg	7.9 kPa
21 mmHg	3.4 kPa	39 mmHg	6.4 kPa	48 mmHg	7.7 kPa
20 mmHg	3.3 kPa	37 mmHg	6.2 kPa	46 mmHg	7.5 kPa
19 mmHg	3.2 kPa	35 mmHg	6.0 kPa	43 mmHg	7.3 kPa

Troubleshooting ECG and ECG/RESP Problems

This section describes how to troubleshoot and correct faults associated with the ECG/RESP module. The procedures for recognizing, isolating, and correcting faults using this module are as follows:

• Identifying a problem based on visual indications or repeated INOPS.

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the ECG/RESP module, perform the following actions:

Step 1 Make sure there is a trunk cable with lead set connected to the module. If not, connect one.

Step 2 Make sure the ECG and RESP parameters are turned on. If they are not, turn them on.

Step 3 Make sure the ECG (HR) and RESP numerics are turned on. If they are not, turn them on.

Step 4 Make sure you don't have more than one ECG/RESP module plugged into the module racks you are using. If more than one ECG/RESP module is plugged in, the supernumerary modules are ignored and should be removed.

Step 5 Check the connection on the module and the rack interface.

1. Unplug and re-plug the ECG/RESP module and check if the green LED on the ECG/RESP module lights up after re-plugging. If it does not, proceed with the following:
2. Put the ECG/RESP module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:
3. *Note: this procedure applies only for setups, in which the ECG/RESP module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the ECG/RESP module and check if the LED lights up. If it does not, proceed with the following:
4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the ECG/RESP module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:
5. Replace the rack and plug in the ECG/RESP module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and one or more INOP messages are displayed for the ECG/RESP module, perform the following actions:

Please note that for proceeding to the next steps a trunk cable with lead set must be connected to the module.

Step 1 Perform a module self-test (See "Performing the ECG or ECG/RESP Module Self-Test" on page 4-57). If the ECG/RESP test numerics read exactly the listed values, proceed to the next step, if not, replace the module.

Step 2 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears. If the problem still exists, replace the module.

Table 4-5 INOP Messages for ECG and ECG/Resp

INOP Message	Possible Cause	Corrective Action
LEADS OFF	Not all required leads are attached or electrodes have been displaced. With activated EASI™ option the wrong lead set is used. Lead set or ECG Module may be defective.	Make sure all electrodes are correctly attached. With activated EASI™ option make sure you are using the correct (5 electrode) lead set. If INOP still is displayed, change lead set. If INOP persists, replace module.
LEADS OFF XX	Single electrode from lead xx detached.	Attach the missing electrode. If INOP still is displayed, see Corrective Action for "LEADS OFF"
LEADS OFF (EL.X)	Single electrode from lead E,S or I is detached (EASI™lead set).	Attach the missing electrode. If INOP still is displayed, see Corrective Action for "LEADS OFF"
ECG/RESP UNPLUGGED	ECG/RESP module is unplugged from the rack.	Perform Step 5 on page 4-9.
ECG EQUIP MALF	Malfunction in ECG hardware.	Replace module.
ECG/RESP UNPLUGGED	ECG/RESP module is unplugged from the rack.	Perform Step 5 on page 4-9.
RESP LEAD OFF	RESP lead is off, electrode detached, or patient cable unplugged.	Make sure all electrodes are correctly attached. If INOP still is displayed, change lead set. If INOP persists, replace module.
RESP EQUIP MALF	Malfunction in RESP hardware.	Replace module.

Troubleshooting Pressure Problems

This section describes how to troubleshoot and correct faults associated with the M1006A and M1006B Pressure plug-in modules. The procedures for recognizing, isolating, and correcting faults with this module are as follows:

• Identifying a problem based on visual indications or repeated INOPS.

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the PRESSURE module, perform the following actions:

Step 1 Make sure there is a transducer connected to the module. If no transducer is connected, connect one.

Step 2 Make sure the PRESSURE parameter is turned on. Turn it on, if it is not.

Step 3 Make sure the PRESSURE numeric is turned on. Turn it on, if it is not.

Step 4 If you want to measure CPP, make sure that one PRESSURE parameter is labeled ICP and both pressures display valid numerics.

Step 5 Make sure you don't have too many PRESSURE module plugged into the module racks you are using. If too many PRESSURE modules are plugged in, you get two status messages: "Too many modules of the same type connected" and "Currently ignored module in rack position x.x". The last message enables you to identify the supernumerary module.
These modules are ignored and should be removed. See Appendix A "Product Information" for specific information concerning your model of the CMS.

Step 6 Check the connection on the module and the rack interface.

1. Unplug and re-plug the PRESSURE module and check if the green LED on the PRESSURE module lights up after re-plugging. If it does not, proceed with the following:
2. Put the PRESSURE module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:
3. *Note: this procedure applies only for setups, in which the PRESSURE module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the PRESSURE module and check if the LED lights up. If it does not, proceed with the following:
4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the

PRESSURE module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:

5. Replace the rack and plug in the PRESSURE module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and one or more INOP messages are displayed for the PRESSURE module, perform the following actions:

Please note that for proceeding to the next steps a transducer must be connected to the module.

Step 1 Perform a module self-test (See "Performing the M1006A/B Pressure Module Self-Test" on page 4-57). If the PRESSURE test numerics read exactly the listed values, proceed to the next step, if not, replace the module.

Step 2 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears. If the problem still exists, replace the module.

Table 4-6 INOP Messages for Pressure

INOP Message	Possible Cause	Corrective Action
<Px> UNPLUGGED	Pressure module is unplugged from the rack.	Perform Step 6 on page 4-11.
<Px> NO TRANSDUCER	No transducer connected to the module.	Connect transducer to module.
<Px> EQUIP MALF	Malfunction in the pressure hardware.	Replace module.
<Px> ZERO + CHECK CAL	Occurs when new transducer attached to module, or when the power is off for longer than one minute and settings transfer is off.	Zero the PRESSURE module.
<Px> OVERRANGE	Measured pressure >361 mmHg, <-41 mmHg.	Replace transducer. If the INOP persists, replace module.
CPP CHECK SOURCES	Occurs for one minute if either the arterial or the intracranial pressure sources are switched off, or the front end modules are removed.	Connect module properly to rack and make sure that the PRESSURE parameter is turned on. Make sure you get valid numerics for ICP and the other pressure. Make sure that the preselected pressure label in the CPP source window is the same as for the second pressure.
CPP CHECK UNITS	Occurs if two pressure sources have different units.	Use the same unit for all PRESSURE modules.

Troubleshooting NBP Problems

Philips uses invasive pressure as reference for NBP. Diastolic measurements can be up to 8 mmHg lower than pressure measured by auscultatory (Korotkoff) method.

To ensure accurate NIBP measurements, the NBP plug-in module can be calibrated. Philips recommends that the module is calibrated once every 12 months.

This section describes how to troubleshoot and correct faults associated with the NBP module. The procedures for recognizing, isolating, and correcting faults with this module are as follows:

- Identifying a problem based on visual indications or repeated INOPS.
- Checking the NBP task window for specific error messages and performing the corrective actions suggested in the table given with this module.
- Calibrating the module as required.

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the NBP module, perform the following actions:

Step 1 Make sure the NBP parameter is turned on. Turn it on, if it is not.

Step 2 Make sure the NBP numeric is turned on. Turn it on, if it is not.

Step 3 Make sure you don't have more than one NBP module plugged into the module racks you are using. If more than one NBP module is plugged in, the supernumerary modules are ignored and should be removed.

Step 4 Check the connection on the module and the rack interface.

1. Unplug and re-plug the NBP module and check if the green LED on the NBP module lights up after re-plugging. If it does not, proceed with the following:
2. Put the NBP module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:
3. *Note: this procedure applies only for setups, in which the NBP module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the NBP module and check if the LED lights up. If it does not, proceed with the following:

4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the NBP module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:
5. Replace the rack and plug in the NBP module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and one or more INOP messages are displayed for the NBP module, perform the following actions:

Step 1 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears. If the problem still exists, replace the module.

Table 4-7 INOP Messages for the NBP Module

INOP Message	Possible Cause	Corrective Action
NBP UNPLUGGED	NBP is unplugged from rack.	Perform Step 4 on page 4-13.
NBP EQUIP MALF	Hardware problem in module or tubing.	Exchange the tubing and restart measurement. If the INOP reoccurs and the message in the NBP task window reads “Pressure values of transducers different”, attempt a calibration (See “Performance Test NBP Module” on page 2-6). If this fails, replace the module.
NBP INTERRUPTED	Strong patient movement or Inflation/deflation time-out – pump problem.	Make sure the patient does not move strongly and restart measurement. Check wether cuff is connected. Check tubing and cuff for leakages and restart measurement.
NBP CUFF OVER-PRESS	Strong patient movement or defect in pneumatic control.	Restart measurement making sure that patient does not move strongly. If INOP reoccurs, replace module.
NBP INCORRECT CUFF	Neonatal cuff used for adult patient size setting.	Make sure the patient size configuration is set to PEDI/NEO and restart measurement.
CUF NOT DEFLATED	Hardware problem in module or tubing.	Exchange the tubing and restart measurement. If the INOP reoccurs, replace module.

Using the Calibration Mode

This task window is displayed after pressing the **Cal Frontend** softkey in the NBP manometer task window.

The keys **Start** , **Stop** , and **Save Values** are displayed at the bottom of the Calibration Mode Task Window. The **Start** key is used to close the valves, the **Stop** key opens the valves and the **Save Values** key is used to store the calibration factor.

Step 1 Press **Start** .

Step 2 Pressurize the gauge as precisely as possible to 220 or 280 mmHg. One of these values (depending on the module) is shown in the NBP manometer task window.

Step 3 Now press one of the following keys:
Save Values : to store the calibration factor.
or **Stop** : to abandon the calibration procedure.

Selecting NBP Measurement Characteristic

WARNING **Consult technical support before changing the NBP measurement characteristic in adult or pediatric mode. Changing the NBP measurement characteristic will significantly change the NBP readings, especially in the elevated pressure range.**

WARNING **The NBP measurement characteristic has to be set and stored individually for each configuration set. The same setting must be selected for all configuration sets.**

NOTE This setting changes the NBP measurement characteristic in adult and pediatric mode. It has no influence on the NBP measurement characteristic in neonatal mode. In neonatal mode the intra-arterial method is always used as a reference standard to validate overall accuracy.

1.Go into service mode

2. Enter the NBP Task Window and press the ‘Change Refernce” key

3. Select desired NBP measurement characteristic (1, 2, or 3) according to the table below

4. Press “Confirm” to store new setting

5.Go into Config mode and select next Config Set

6.Repeat Steps 1 to 5 for all Config Sets

Selection	Description	Reference Standard for Validation
1	NBP measurement characteristic of CMS/V24/ V26 Rel. B.0 and earlier. Recommended only in mixed installations with Rel. B.0 or earlier.	Intra-arterial according to ANSI/AAMI SP10-1987. The blood pressure measurements determined with this device and measurement characteristic set to “1” comply with the American National Standard for Electronic or Automated Sphygmomanometers (ANSI/AAMI SP-10-1987) in relation to mean error and standard deviation, when compared to intra-arterial measurements in a representative patient population.
2	NBP measurement characteristic of M3/M4 Rel. B and earlier (higher diastolic values than 1). Recommended if customer prefers calibration against manual auscultatory reference method.	**Auscultatory** according to ANSI/AAMI SP10-1992. The blood pressure measurements determined with this device and measurement characteristic set to “2” comply with the American National Standard for Electronic or Automated Sphygmomanometers (ANSI/AAMI SP-10-1992) in relation to mean error and standard deviation, when compared to auscultatory measurements in a representative patient population. For the auscultatory reference the 5th Korotkoff sound was used to determine the diastolic pressure.
3 (Factory Default)	NBP measurement characteristic of CMS/V24/ V26 Rel. C.0 and later Recommended in all other cases than described above.	**Intra-arterial** according to ANSI/AAMI-SP10-1992. The blood pressure measurements determined with this device and measurement characteristic set to “3” comply with the American National Standard for Electronic or Automated Sphygmomanometers (ANSI/AAMI SP10-1992) in relation to mean error and standard deviation, when compared to intra-arterial measurements in a representative patient population.

The setting of NBP measurement characteristic is stored in the monitor and can be cloned with the cloning tool.

Troubleshooting Cardiac Output Problems

This section describes how to troubleshoot and correct faults associated with the Cardiac Output plug-in module. The procedures for recognizing, isolating, and correcting faults with this module are as follows:

• Identifying a problem based on visual indications or repeated INOPS.

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the C.O. module, perform the following actions:

Step 1 Make sure there is a C.O. Interface Cable and a catheter connected to the module. If not, connect them.

Step 2 Make sure the C.O. parameter is turned on. Turn it on, if it is not.

Step 3 Make sure the C.O. numeric is turned on. Turn it on, if it is not.

Step 4 Make sure you don't have more than one C.O. module plugged into the module racks you are using. If more than one C.O. module is plugged in, the supernumerary modules are ignored and should be removed.

Step 5 Check the connection on the module and the rack interface.

1. Unplug and re-plug the C.O. module and check if the green LED on the C.O. module lights up after re-plugging. If it does not, proceed with the following:
2. Put the C.O. module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:
3. *Note: this procedure applies only for setups, in which the CO module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the CO module and check if the LED lights up. If it does not, proceed with the following:
4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the C.O. module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:
5. Replace the rack and plug in the C.O. module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and one or more INOP messages are displayed for the C.O. module, perform the following actions:

Please note that for proceeding to the next steps a C.O. Interface Cable plus catheter and Injectate Temperature Probe or the Service Tool (M1012-61601) must be connected to the module.

Step 1 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears. If the problem still exists, proceed to the next step.

Table 4-8 INOP Messages for the C.O. Module

INOP Message	Possible Cause	Corrective Action
C.O. UNPLUGGED	C.O. module is unplugged from the rack.	Perform Step 5 on page 4-17.
Tblood NO TRANSDUC or CCO/Tbl NO TRANSD	No C.O. Interface Cable attached to the module. Catheter not connected to C.O. Interface Cable or cable broken.	Make sure that all cables are properly connected and the connectors are free from dirt. Connect Service Tool M1012-61601 to C.O. Interface Cable[1]. The Tblood numeric must read exactly 37.0 +/- 0.1°C, otherwise the module or C.O. Interface Cable is defect and has to be replaced. If you get the correct reading from the Service Tool and the INOP still appears, replace the catheter. If the INOP still appears, replace the C.O. Interface Cable. If the INOP still appears, replace the module.
C.O. EQUIP MALF	Malfunction in the C.O. hardware.	Perform Step 5 on page 4-17. If INOP is still displayed, replace module.
CCO NOT SUPPORTED	User has changed the Transpulmonary Catheter to a Right Heart Catheter. Defective catheter or cable broken.	Make sure that you use a CO module with option C10 and a Transpulmonary Catheter. If INOP remains, connect Service Tool[1] (M1012-61601) and enter the Setup C.O. Task Window by pressing the SETUP key on the module. Check if the entry behind “Method of Measurement” reads “Transpulmonary” and the entry behind “Arterial Catheter Constant” reads “341”. If INOP remains with connected Service Tool, perform corrective actions listed for CCO/Tbl NO TRANSD.
CCO NO ABP[2]	The pressure source which is selected for CCO Pulse Contour Calculation is not available.	Make sure that the pressure, which is used for the CCO Pulse Contour Calculation is labeled as selected in the CCO Setup Task Window.

Table 4-8 INOP Messages for the C.O. Module

INOP Message	Possible Cause	Corrective Action
CCO ABP[a] INVALID	The pressure for CCO Pulse Contour Calculation is not valid.	Make sure you get valid numerics for ABP[a]. For more information refer to the Pressure Module section in the *User's Reference Manual.*
CCO NO CAL.	No valid calibration for CCO.	Perform C.O. measurement and CCO calibration.
CCO BAD PRESS SIGN	The pressure wave for CCO Pulse Contour calculation cannot be analyzed.	Make sure to get a proper, undamped pressure wave. For more information refer to the C.O. Module section in the *User's Reference Manual.*

1. For correct use of the Service Tool, see "Performance Test Cardiac Output" on page 2-8
2. ABP is only a placeholder. Always the selected pressure label is shown in the string.

Step 2 Enter the Measure C.O. Task Window by pressing the START key on the C.O. module. The Measure C.O. Task Window displays messages dealing with C.O. module failures. The following table describes the messages and corrective actions to take.

Table 4-9 Task Window messages for the C.O. Module

Task Window Message	Possible Cause	Corrective Action
no Tinj transducer connected	Cable of Injectate Temperature Probe is not connected or broken. Faulty module.	Make sure that cable of the Injectate Temperature Probe is properly connected to the C.O. Interface Cable and the connector is free from dirt. Connect Service Tool M1012-61601 to C.O. Interface Cable[1]. If you use the *C.O. module without option C10* you must get the following results, otherwise the module or C.O. Interface Cable are defect and have to be replaced: • Tinj numeric reads exactly 0.0°C • No prompt message "Tinj transducer connected" appears in the Measure C.O. Task Window. If you use the *C.O. module with option C10* you must get the following results, otherwise the module or C.O. Interface Cable are defect and have to be replaced: • No prompt message "Tinj transducer connected" appears in the Measure C.O. Task Window. If you get the correct results from the Service Tool and the Task Window message still appears, replace the Injectate Temperature Probe.

Table 4-9 Task Window messages for the C.O. Module

Task Window Message	Possible Cause	Corrective Action
Unexpected catheter, check catheter constant[2]	The C.O. module is not able to identify the Transpulmonary Catheter type. Faulty C.O. Interface Cable, module or catheter.	*Note: the following procedure applies only for C.O. modules with option C10:* Make sure that catheter and C.O. Interface Cable are properly connected and the connector is free from dirt. Connect Service Tool M1012-61601 to C.O. module[1] and enter the Setup C.O. Task Window by pressing the SETUP key on the module. The entry behind "Method of Measurement" must read "Transpulmonary". The entry behind "Arterial Catheter Constant" must read "341". If you don't get these results, replace the C.O. Interface Cable and check the readings again. If they are still wrong, the module is defect and has to be replaced. If you get the correct results from the Service Tool and the Task Window message still appears, replace the catheter.
Unknown catheter	Faulty C.O. Interface Cable, module or catheter.	Make sure that catheter and C.O. Interface Cable are properly connected and the connector is free from dirt. Connect Service Tool M1012-61601 to C.O. module[1]. If Task Window message now has disappeared, replace catheter. If Task Window message still appears, replace C.O. Interface Cable. If Task Window message still appears, replace module.

1. For correct use of the Service Tool, see "Performance Test Cardiac Output" on page 2-8
2. #C10 modules only

❑ If a **small -?- in addition to a numeric** and one or more INOP messages are displayed for the C.O. module, the values are questionable. Correct the possible cause identified by the INOP message and verify that the INOP disappears.

Table 4-10 INOP Messages with questionable values for the C.O. Module

INOP Message	Possible Cause	Corrective Action
CCO CHECK CAL	CCO calibration is older than 8 hours.	Perform C.O. measurement and CCO calibration.
SVR MISSING CVP	No valid CVP available at the moment. CVP is automatically set to 0 mmHg for the continuous SVR calculation	If you need an accurate continuous SVR measurement, perform a CVP measurement and make sure that the pressure which is used for the CVP measurement is labeled “CVP”. Make sure you get valid numerics for CVP. For more information refer to the Pressure Module section in the *User’s Reference Manual*.

Troubleshooting SpO_2/Pleth Problems

This section describes how to troubleshoot and correct faults associated with the SpO_2/Pleth plug-in module. The procedures for recognizing, isolating, and correcting faults with this module are as follows:

• Identifying a problem based on visual indications or repeated INOPS.

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the SpO2/Pleth module, perform the following actions:

Step 1 Make sure there is a transducer connected to the module. If no transducer is connected, connect one.

Step 2 Make sure the SpO2/Pleth parameter is turned on. Turn it on, if it is not.

Step 3 Make sure the SpO2/Pleth numeric is turned on. Turn it on, if it is not.

Step 4 Make sure you don't have too many SpO2/Pleth module plugged into the module racks you are using. If too many SpO2/Pleth modules are plugged in, you get two status messages: "Too many modules of the same type connected" and "Currently ignored module in rack position x.x". The last message enables you to identify the supernumerary module.
These modules are ignored and should be removed. See Appendix A "Product Information" for specific information concerning your model of the CMS.

Step 5 Check the connection on the module and the rack interface.

1. Unplug and re-plug the SpO2/Pleth module and check if the green LED on the SpO2/Pleth module lights up after re-plugging. If it does not, proceed with the following:
2. Put the SpO2/Pleth module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:
3. *Note: this procedure applies only for setups, in which the SpO2/PlethSpO2/Pleth module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the SpO2/Pleth module and check if the LED lights up. If it does not, proceed with the following:
4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the SpO2/Pleth module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:

5. Replace the rack and plug in the SpO2/Pleth module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and one or more INOP messages are displayed for the SpO2/Pleth module, perform the following actions:

Please note that for proceeding to the next steps a transducer must be connected to the module.

Step 1 Perform a Self-Test (See "Performing the SpO_2/Pleth Module Self-Test" on page 4-58). If the SpO2/Pleth test numerics read exactly the listed values, proceed to the next step, if not, replace the module.

Step 2 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears. If the problem still exists, replace the module.

Table 4-11 INOP Messages for the SpO_2/Pleth Module

INOP Message	Possible Cause	Corrective Action
SpO_2 /PLETH NO TRANSDUCER	No transducer is connected to the module	Connect transducer to module.
SpO_2 /PLETH EQUIP MALF	Malfunction in the transducer or module.	Replace transducer. If INOP persists, replace module
SpO_2 /PLETH UNPLUGGED	SpO_2 /PLETH module is unplugged from the rack.	Perform Step 5 on page 4-22
SpO_2 ERRATIC	Erratic SpO_2 measurements, often due to a faulty transducer, or invalid SpO_2 measurements; often due to the transducer being incorrectly positioned.	Reposition transducer. If the INOP persists, replace transducer.
SpO_2/PLETH NOISY SIGNAL	Patient movement or electrical interference are causing irregular pulse patterns.	Make sure that patient does not move strongly. If INOP persists, move cable away from power cords.
SpO_2/PLETH INTERF	Level of ambient light and/or cable induced electrical interference is so high, that the SpO_2 transducer cannot measure pulse rate.	Cover transducer against ambient light and move cable away from power cords.
SpO_2/PLETH NON-PULSATILE	Pulse is too weak or not detectable.	Move transducer to another application site.
PLETH REDUCE SIZE	Transducer displaced or strong vasodilation after automatic wave fixing.	Press Optimize Size softkey in PLETH Task Window to restore the PLETH wave.
SpO_2 TRANSD MALF or PLETH TRANSD MALF	SpO_2 transducer is defective due to inadequate diode output.	Replace the transducer.

Troubleshooting SvO_2 Problems

This section describes how to troubleshoot and correct faults associated with the $S\bar{v}O_2$ plug-in module. The procedures for recognizing, isolating, and correcting faults with this module are as follows:

• Identifying a problem based on visual indications or repeated INOPS.

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the $S\bar{v}O_2$ module, perform the following actions:

Step 1 Make sure there is a Abbott optical module and catheter connected to the module. If not, connect one.

Step 2 Make sure the $S\bar{v}O_2$ parameter is turned on. Turn it on, if it is not.

Step 3 Make sure the $S\bar{v}O_2$ numeric is turned on. Turn it on, if it is not.

Step 4 Make sure you don't have more than one $S\bar{v}O_2$ module plugged into the module racks you are using. If more than one $S\bar{v}O_2$ module is plugged in, the supernumerary modules are ignored and should be removed.

Step 5 Check the connection on the module and the rack interface.

1. Unplug and re-plug the $S\bar{v}O_2$ module and check if the green LED on the $S\bar{v}O_2$ module lights up after re-plugging. If it does not, proceed with the following:
2. Put the $S\bar{v}O_2$ module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:
3. *Note: this procedure applies only for setups, in which the $S\bar{v}O_2$ module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the $S\bar{v}O_2$ module and check if the LED lights up. If it does not, proceed with the following:
4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the $S\bar{v}O_2$ module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:
5. Replace the rack and plug in the $S\bar{v}O_2$ module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and one or more INOP messages are displayed for the $S\bar{v}O_2$ module, perform the following actions:

Please note that for proceeding to the next steps a Abbott optical module and transducer must be connected to the module.

Step 1 Perform a Self-Test (See "Performing the SvO_2 Module Self-Test" on page 4-60). If the $S\bar{v}O_2$ test numeric reads exactly the listed value, proceed to the next step, if not, replace the module.

Step 2 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears. If the problem still exists, replace the module.

Table 4-12 INOP Messages for SvO_2 Module

Symptom	Possible Cause	Corrective Action
SvO_2 UNPLUGGED	SvO_2 module is unplugged from the rack	Plug SvO_2 module into rack.
SvO_2 NO OPT-MOD	Abbott Optical Module not connected. Loose or broken connection between Abbott Optical Module and M1021A	Check set-up (described in Reference Manual). Replace Abbott Optical Module.
SvO_2 CONFIGURATION	Abbott Optical Module has been used with Abbott monitor (Oximetrix 3) and configured to SaO_2 Computation Mode.	Reconfigure the Abbott Optical Module to SvO_2 Computation Module using the Abbott Oximetrix^{R}3 monitor.
SvO_2 CAL REQUIRED	No valid calibration data in the Abbott Optical Module.	Perform Pre-insertion Calibration if the catheter is still in the Optical Reference or In-Vivo Calibration if the catheter has been inserted into the patient.
SvO_2 CONNCT OPTMOD	Abbott Optical Module became disconnected during storage of data.	Reconnect the Optical Module for at least 20 seconds.
SvO_2 OPT-MOD DEFECT	Abbott Optical Module or M1021A memory defect - calibration and patient data cannot be stored for transport.	Try different Abbott Optical Module. If problem persists try different M1021A.
SvO_2 EQUIP MALF	M1021A or Abbott Optical Module is defective.	Unplug Abbott Optical Module from M1021A and perform a self-test under the Monitor Setup Key. If INOP remains, replace the SvO_2 module. If INOP disappears, replace Abbott Optical Module then consult local Abbott representative for information relating to the Abbott Optical Module.

Table 4-12 INOP Messages for SvO_2 Module

Symptom	Possible Cause	Corrective Action
SvO_2 WARM UP	Initial one minute Abbott Optical Module warm-up/ connection period.	Inop is displayed for minimum time required. However, prior to performing Pre-Insertion or In-Vivo Calibration, Abbott recommends a full 15 minute warm-up period.
SvO_2 LOW LIGHT	Unusually low level of light is being received by the system from the catheter due to: Catheter tip or Abbott Optical Module exposed to room light. Damaged catheter fiberoptics. Poor catheter connection to Abbott Optical Module. Poor connection between Abbott Optical Module and M1021A. Defective Abbott Optical Module. Defective M1021A.	Check setup and connections. Ensure that fiber-optic interfaces of Abbott Optical Module and catheter are clean. If no catheter is connected to Abbott Optical Module, close Optical Module door and shield from room light. If message persists, try, in turn, different Optical Modules and M1021A to isolate the source. If catheter is connected to Abbott Optical Module and catheter tip has been removed from the Optical Reference but has not yet been inserted into the patient, the SvO_2 LOW LIGHT INOP is displayed until the catheter is inserted into the patient. If catheter is still in tray, ensure that the catheter tip is correctly positioned in the Optical Reference. If INOP persists, disconnect catheter, close Abbott Optical Module door and shield from room light. If INOP disappears, try a different catheter. If INOP remains, either the optical Module or M1021A is at fault. Isolate accordingly as above. If catheter is inserted into patient, review light intensity signals. Check catheter positioning, patency and catheter clamping to ensure optimal signal. If INOP persists, replace Abbott Optical Module (perform In-Vivo calibration if INOP disappears). If INOP still persists, replace catheter and recommence measurement procedure.

Table 4-12 INOP Messages for SvO_2 Module

Symptom	Possible Cause	Corrective Action
SvO_2 LIGHT INTENS	Intensity changed considerably since last Light Intensity Calibration.	Check Light Intensity trend using most detailed time frame.
	High Intensities: Catheter tip against vessel wall	Confirm proper catheter position by examination of pressure waveforms.
	Low Intensities: Damaged catheter	Check for kinks in the catheter or excessive catheter clamping.
	Inadequate blood flow past catheter tip.	Check for distal lumen patency.
	Poor optical interface between the catheter and Abbott Optical Module	Check for clean and secure connection.
	Damped or Erratic Intensities: Catheter tip clotting	Check pressure waveform for damping and ensure distal lumen patency.
	Spontaneous catheter wedging.	Check pressure waveform and ensure catheter is correctly positioned.
		After making all efforts to obtain a normal Light Intensity, perform a Light Intensity Calibration. (An In-Vivo Calibration may also be required.) Run a Calibration as described in SvO_2 Module section of the *User's Reference Manual.*
SvO_2 CAL FAILED	Light Intensity signal drift has occurred after completion of Pre-insertion Calibration and before insertion of catheter into patient.	Allow optimum warm-up time before any calibration procedure (minimum 15 minutes). If INOP appears prior to removing catheter tip from Optical Reference, repeat Pre-insertion Calibration. If INOP is noted after the catheter tip is removed from the Optical Reference, insert the catheter into patient, ensure optimal light intensity signal, then perform In-Vivo Calibration.
SvO_2 UNABLE TO MEASURE	Signal received is outside normal range such that SvO_2 values cannot be derived.	Check for problems associated with LOW LIGHT or LIGHT INTENS INOPs. Check catheter position, patency and clamping, ensure optimal Light Intensity signal and perform Light Intensity and In-Vivo Calibrations.

Troubleshooting FIO_2 Module Problems

This section describes how to troubleshoot and correct faults associated with the FIO_2 module. The procedures for recognizing, isolating, and correcting faults using this module are as follows:

• Identifying a problem based on visual indications or repeated INOPS.

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the FIO_2 module, perform the following actions:

Step 1 Make sure there is a transducer connected to the module. If no transducer is connected, connect one.

Step 2 Make sure the FIO_2 parameter is turned on. Turn it on, if it is not.

Step 3 Make sure the FIO_2 numeric is turned on. Turn it on, if it is not.

Step 4 Make sure you don't have more than one FIO_2 module plugged into the module racks you are using. If more than one FIO_2 module is plugged in, the supernumerary modules are ignored and should be removed.

Step 5 Check the connection on the module and the rack interface.

1. Unplug and re-plug the FIO_2 module and check if the green LED on the FIO_2 module lights up after re-plugging. If it does not, proceed with the following:
2. Put the FIO_2 module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:
3. *Note: this procedure applies only for setups, in which the* FIO_2 *module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the FIO_2 module and check if the LED lights up. If it does not, proceed with the following:
4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the FIO_2 module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:
5. Replace the rack and plug in the FIO_2 module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and you find INOP messages displayed for the FIO_2 module, perform the following actions:

Please note that for proceeding to the next steps a transducer must be connected to the module.

Step 1 Perform a Self-Test (See "Performing the FIO_2 Module Self-Test" on page 4-61). If the FIO_2 test numerics read exactly the listed values, proceed to the next step, if not, replace the module.

Step 2 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears. If the problem still exists, replace the module.

Table 4-13 INOP Messages for the FIO_2 Module

INOP Message	Possible Cause	Corrective Action
FIO_2 UNPLUGGED	FIO_2 module is unplugged from the rack.	Perform Step 5 on page 4-28
FIO_2 EQUIPM MALF	Internal test or offset values out of range or transducer lead C cable break.	Change electrolyte and membrane If INOP persists, replace transducer. If INOP persists, replace module.
FIO_2 NO TRANSDUCER	Transducer not connected or transducer lead cable A or B cable break.	Make sure that transducer is connected properly. If INOP persists, replace transducer lead cables.
FIO_2 FAILED CAL	Signal out of range or it drifts during calibration.	If electrolyte and membrane have been changed before, wait at least 4 hours, before restarting calibration. For detailed information on how to perform a calibration please refer to the *User's reference Manual*. If 100% calibration failed, check gas supply. If INOP persists, change electrolyte and membrane, wait 4 hours and restart calibration.
FIO_2 CAL RUNNING	The 21% or 100% calibration is running.	Wait until calibration has finished.
FIO_2 OUT OF RANGE	FIO_2 <0.10, >1.10 due to incorrect calibration.	Re-calibrate transducer. For detailed information on how to perform a calibration please refer to the *User's reference Manual*.
FIO_2 CHECK CAL	Transducer not calibrated since last start.	Perform calibration.For detailed information on how to perform a calibration please refer to the *User's reference Manual*.
FIO_2 BATTERY	Module battery is not charged or is defective.	Wait 2 hours until battery has been recharged. If INOP still is displayed, replace module.

Troubleshooting Temperature Module Problems

This section describes how to troubleshoot and correct faults associated with the Temperature plug-in module. The procedures for recognizing, isolating, and correcting faults using this module are as follows:

• Identifying a problem based on visual indications or repeated INOPS.

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the TEMP module, perform the following actions:

Step 1 Make sure there is a TEMP probe connected to the module. If not, connect one.

Step 2 Make sure the TEMP parameter is turned on. Turn it on, if it is not.

Step 3 Make sure the TEMP numeric is turned on. Turn it on, if it is not.

Step 4 Make sure you don't have too many TEMP module plugged into the module racks you are using. If too many TEMP modules are plugged in, you get two status messages: "Too many modules of the same type connected" and "Currently ignored module in rack position x.x". The last message enables you to identify the supernumerary module.
These modules are ignored and should be removed. See Appendix A "Product Information" for specific information concerning your model of the CMS.

Step 5 Check the connection on the module and the rack interface.

1. Unplug and re-plug the TEMP module and check if the green LED on the TEMP module lights up after re-plugging. If it does not, proceed with the following:
2. Put the TEMP module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:
3. *Note: this procedure applies only for setups, in which the TEMP module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the TEMP module and check if the LED lights up. If it does not, proceed with the following:
4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the TEMP module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:

5. Replace the rack and plug in the TEMP module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and a INOP message is displayed for the TEMP module, perform the following actions:

Please note that for proceeding to the next steps a transducer must be connected to the module.

Step 1 Perform a Self-Test (See "Performing the Temperature Module Self-Test" on page 4-62). If the TEMP test numeric reads exactly the listed value, proceed to the next step, if not, replace the module.

Step 2 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears. If the problem still exists, replace the module.

Table 4-14 INOP Messages for the Temp Module

INOP Message	Possible Cause	Corrective Action
<Tx> UNPLUGGED	TEMP module is unplugged from the rack.	Perform Step 5 on page 4-30.
<Tx> NO TRANSDUC	Temperature probe disconnected from the module.	Connect Temperature probe to module.
<Tx> OVERRANGE	Temperature out of range <-1°C or >45°C.	Replace Temperature probe. If problem still persists, replace module.
<Tx> EQUIP MALF	Malfunction in the TEMP module hardware	Replace module.

Troubleshooting CO_2 Module Problems

This section describes how to troubleshoot and correct faults associated with the CO_2 plug-in module. The procedures for recognizing, isolating, and correcting faults with this module are as follows:

• Identifying a problem based on visual indications or repeated INOPS.

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the CO_2 module, perform the following actions:

Step 1 Make sure there is a transducer connected to the module. If no transducer is connected, connect one.

Step 2 Make sure the CO_2 parameter is turned on. Turn it on, if it is not.

Step 3 Make sure the CO_2 numeric is turned on. Turn it on, if it is not.

Step 4 Make sure you don't have more than one CO_2 module plugged into the module racks you are using. If more than one CO_2 module is plugged in, the supernumerary modules are ignored and should be removed.

Step 5 Check the connection on the module and the rack interface.

1. Unplug and re-plug the CO_2 module and check if the green LED on the CO_2 module lights up after re-plugging. If it does not, proceed with the following:
2. Put the CO_2 module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:
3. *Note: this procedure applies only for setups, in which the* CO_2 *module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the CO_2 module and check if the LED lights up. If it does not, proceed with the following:
4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the CO_2 module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:
5. Replace the rack and plug in the CO_2 module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and one or more INOP messages are displayed for the CO_2 module, perform the following actions:

Please note that for proceeding to the next steps a transducer must be connected to the module.

Step 1 Perform a Self-Test (See "Performing the CO_2 Module Self-Test" on page 4-61). If the CO_2 test numerics read exactly the listed values, proceed to the next step, if not, replace the module.

Step 2 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears. If the problem still exists, replace the module.

Table 4-15 INOP Message for CO_2 Module

INOP Message	Possible Cause	Corrective Action
CO_2 UNPLUGGED	CO_2 module is unplugged from the rack.	Perform Step 5 on page 4-32.
CO_2 EQUIPM MALF	Malfunction in the transducer or module.	Replace transducer. If INOP persists replace module.
CO_2 NO TRANSDUCER	No Transducer is connected to the module.	Connect transducer to module. Run a calibration as described in CO_2 Module section of the *User's Reference Manual*. (If the transducer is replaced, the new transducer must be re-calibrated.)
CO_2 FAILED CAL	Calibration aborted due to power failure, unstable signal during calibration, or transducer being placed on the wrong cal cell.	Run a calibration as described in CO_2 Module section of the *User's Reference Manual*. Make sure that calibration cell is changed when prompted. If INOP persists replace module.
CO_2 SENSOR WARM UP	The transducer has not reached operating temperature.	Wait until transducer has warmed up.
CO_2 CAL RUNNING	The CO_2 calibration is running.	Wait until calibration is finished.
CO_2 CAL MODE	Cal mode is set but the calibration has not been initiated.	Perform accuracy check or start a calibration as described in CO_2 Module section of the *User's Reference Manual*.
CO_2 CHECK CAL	CO_2 value <-2mmHg, >150mmHg.	Perform accuracy check for low and high calstick cell as described in CO_2 Module section of the *User's Reference Manual*.
CO_2 REDUCE SIZE	$ETCO_2$ >60mmHg in 40mmHg wave scale.	Select the 60 mmHg scale. This enables the full wave to be displayed.

Table 4-15 INOP Message for CO_2 Module

INOP Message	Possible Cause	Corrective Action
CO_2 LOW FLOW	Sidestream flow between 50-80 ml for up to 10 minutes. CO_2 values may not be accurate.	Replace tubing.
CO_2 OCCLUSION	Sidestream flow between 50-80 ml for more than 10 minutes or Tubing locked in pump system, tubing or filter to patient.	Replace tubing.
CO_2 SIDESTRM MALF	Sidestream malfunction in the transducer or module.	Replace module.
CO_2 SIDESTRM OFF	Pump automatically has turned off after 60 min of C02 < 3 mmHg or apnea.	Restart Sidestream in CO_2 setup.

Troubleshooting Blood Analysis Module Problems

This section describes how to troubleshoot and correct faults associated with the Blood Analysis plug-in module. The procedures for recognizing, isolating, and correcting faults with this module are as follows:

- Identifying a problem based on repeated INOPS.
- Checking the Blood Analysis task window for specific error messages and performing the corrective actions suggested in the table given with this module.

To Troubleshoot the Module

❑ If you are **unable to access the Blood Analysis module Task Window**, perform the following actions:

Step 1 Make sure the Blood Analysis parameter is turned on. Turn it on, if it is not.

Step 2 Make sure you don't have more than one Blood Analysis module plugged into the module racks you are using. If more than one Blood Analysis module is plugged in, the supernumerary modules are ignored and should be removed.

Step 3 Check the connection on the module and the rack interface.

1. Unplug and re-plug the Blood Analysis module and check if the 2 green LEDs on the Blood Analysis module light up after re-plugging. If they do not, proceed with the following:
2. Put the Blood Analysis module into another slot and check the LEDs once again. If they light up now, the connector for the previous slot is faulty and the rack needs to be replaced. If they do not, proceed with the following:
3. *Note: this procedure applies only for setups, in which the Blood Analysis module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the Blood Analysis module and check if the LEDs light up. If they do not, proceed with the following:
4. Plug any other (not faulty) module into the same slot and check if the LEDs light up. If the LEDs of the alternative module light up, the Blood Analysis module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:
5. Replace the rack and plug in the Blood Analysis module into the new rack. If the LEDs on the module do not light up, replace the rack interface card in the function box.

❑ If **INOP messages** are displayed for the Blood Analysis module, perform the following actions. More detailed information relating to the cause of some of the INOPs can be found in the Blood Analysis Task Window (see Table 4-17 on page 4-37). Correct the possible cause identified by the INOP message and verify that the INOP disappears.

Table 4-16 INOP Messages for Blood Analysis Module

INOP Message	Possible Cause	Corrective Action
BLOODANL UNPLUGGED	Blood Analysis module has been unplugged from the rack.	Perform Step 3 on page 4-35.
BLOODANL EQU. MALF	Permanent malfunction in the module.	Refer to the related Task Window messages in Table 4-17 on page 4-37.
BLOODANL CONFIG	A configuration problem has been detected.	Refer to the related Task Window messages in Table 4-17 on page 4-37.
BLOODANL ROOM TEMP?	Module environment is too warm or too cold - operating range 16 to 30°C (64 to 86°F).	Refer to the related Task Window messages in Table 4-17 on page 4-37.

❑ If a **measurement is unsuccessful** or parameters are missing, perform the following actions:

Step 1 *Note: This step only applies for customers, who preselected the <Result Selection> ON in Configuration Mode.*
Make sure that all parameter results you intended to display are switched on in the Results Selection Task Window.
If you have already confirmed the measurement, perform a new measurement to check, if the error still exists. If you haven't confirmed the measurement yet, the change will be visible immediately.

Step 2 The Task Window displays messages dealing with Blood Analysis module failures. The following table describes the messages and corrective actions to take.
If errors occur repeatedly, make a note of the error codes as these can be used for diagnostic purposes at the factory and must be documented when a module is exchanged.

Table 4-17 Task Window messages for the Blood Analysis Module

Message in Task Window	INOP or prompt message	Error Code	Possible Cause	Corrective Action
Temperature out of range	BLOODANL ROOM TEMP	2	The room temperature is too cold or warm - operating range is 16 to 30°C (64 to 86°F). The filter is blocked or the ventilator fan in the module malfunctions.	Ensure that ambient temperature is within the operating limits and leave time for the module to acclimatize after transport or storage. Inspect the filter and clean it if necessary. If the message still appears, call your service representative.
New Software Installed, Use Simulator		3	The software or CLEW was recently updated.	Run the electronic simulator.
Analysis Interrupted, Use Other Cartridge		4, 8	Module has been pulled out of the rack during a measurement and then replaced.	Wait for the locked LED to go off then remove the cartridge and start the measurement again with a new cartridge.
Invalid Date, Check clock	BLOODANL CONFIG	11	Implausible date in CMS.	Check date settings in the CMS and make sure they are correct.
Invalid or Expired CLEW, See Manual	BLOODANL CONFIG	12, 13	Invalid date code in CMS. CLEW version maybe expired. CLEW update has not been successfully finished.	Check date settings in the CMS and make sure your date settings are correct. Refer to the application note of the current CLEW version. Reinstall the current CLEW version.
Invalid Customization Data	BLOODANL CONFIG	14	Customization update unsuccessful	Reinstall the current Customization version.
Invalid Software Detected	BLOODANL CONFIG	53	Wrong software type installed.	Update System with correct type of software.
Incompatible Language	BLOODANL CONFIG	297	CMS language and module language are not compatible.	Call your service representative.

Table 4-17 Task Window messages for the Blood Analysis Module

Message in Task Window	INOP or prompt message	Error Code	Possible Cause	Corrective Action
Module Error, Use Electronic Simulator	Blood Analysis failed	48, 50-52, 58-62, 70	A cartridge or electronic simulator was inserted at an angle or the simulator is malfunctioning.	If the error occurs when using a cartridge, run the electronic simulator. If the error occurs when running the simulator, use another simulator. If the error recurs, the module or simulator may need repair - call your service representative.
Module Error, See Manual	BLOODANL EQU. MALF	1, 23, 63, 65-68, 72-74, 76-78, 82, 85, 86, 89, 90, 91-94, 256-296, 298-299	May have various malfunction causes located in the module.	Use an electronic simulator twice then use a cartridge with sample or control solution. If an error condition occurs, call your service representative.
Cartridge Not Inserted Properly	Blood Analysis failed	47	Cartridge or simulator is probably not pushed in completely. Cartridge was removed after starting a measurement.	Reinsert the cartridge or electronic simulator. Start measurement with a new cartridge. If error recurs, call your service representative.
Cartridge Preburst, Use Other Cartridge	Blood Analysis failed	21	The module detected fluid on the Sensors before it should have.	Cartridge was probably either pressed in the centre bursting the calibration pack or was stored in conditions too warm or too cold. Try another cartridge.
Unable to Position Sample	Blood Analysis failed	31, 34	No movement of sample detected, possibly due to a clot in sample, not closing the sample well cover or an aberrant cartridge.	Perform a new measurement making sure that you fill the cartridge properly.

Table 4-17 Task Window messages for the Blood Analysis Module

Message in Task Window	INOP or prompt message	Error Code	Possible Cause	Corrective Action
Sample Positioned Short of Fill Mark	Blood Analysis failed	35, 36	The cartridge was underfilled, the sample must reach the fill mark.	Perform a new measurement making sure that you fill the cartridge properly.
Sample Positioned Beyond Fill Mark	Blood Analysis failed	30, 37	Cartridge was overfilled. The sample was past the fill mark.	Perform a new measurement making sure that you fill the cartridge properly.
Insufficient sample	Blood Analysis failed	38, 39	Either not enough sample in the sample well or there are bubbles in the sample.	Perform a new measurement making sure that you fill the cartridge properly and without bubbles.
Cartridge Error, Use Other Cartridge	Blood Analysis failed	20, 22, 24-29, 32, 33, 40-43, 45, 46, 79, 80, 81, 87	Can be caused by sample related problems, cartridge or module. Single or sporadic errors are most likely a sample-related problem (an interference), an aberrant cartridge or a user-induced situation such as touching contacts or pressing on center of cartridge.	Try another cartridge. If error recurs repeatedly, call your service representative.
Cartridge Type Not Recognized	Blood Analysis failed	69	Either the cartridge type is not compatible with the software revision, or the module is at fault.	If this is a new type of cartridge being used, arrange a software upgrade. If not, call your service representative.

Troubleshooting EEG Module Problems

This section describes how to troubleshoot and correct faults associated with the EEG plug-in module. The procedures for recognizing, isolating, and correcting faults using this module are as follows:

- Identifying a problem based on visual indications or repeated INOPS.
- Using an EEG Module accessory, the EEG Test Device (see Chapter 6 “Parts List for CMS”).

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the EEG module, perform the following actions:

Step 1 Make sure there is a EEG transducer connected to the module. If not, connect one.

Step 2 Make sure the EEG parameter is turned on. Turn it on, if it is not.

Step 3 Make sure the EEG numeric is turned on. Turn it on, if it is not.

Step 4 Make sure you don’t have more than one EEG module plugged into the module racks you are using. If more than one EEG module is plugged in, the supernumerary modules are ignored and should be removed.

Step 5 Check the connection on the module and the rack interface.

1. Unplug and re-plug the EEG module and check if the green LED on the EEG module lights up after re-plugging. If it does not, proceed with the following:
2. Put the EEG module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:
3. *Note: this procedure applies only for setups, in which the EEG module is located in a Satellite Rack. If this does not apply for your situation, proceed with 4.*
   Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the EEG module and check if the LED lights up. If it does not, proceed with the following:
4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the EEG module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:
5. Replace the rack and plug in the EEG module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and one or more INOP messages are displayed for the EEG module, perform the following actions:

Step 1 Check the performance of the module with the EEG test device (if available).The test device enables you to compare the module electrode impedance values with the expected values. This information enables you to isolate a problem either to the module or to the cable.

The EEG Test Device looks like a connector cable. One end plugs into the 12-pin connector at the front of the EEG Module. The other end of the Test Device cable is a BNC connector.

The BNC connector of the EEG Test Device can be plugged into a function generator (for example, the Philips 33120A) to generate a simulated EEG signal on the CMS monitor.

Perform the following actions:

1. Select monitoring mode on the CMS.
2. Plug the Test Device into the EEG Module, leaving the BNC connector end unconnected.
3. Press the EEG hardkey on the module.
4. Press the “Electrode Impedance” softkey on the CMS.
5. Check that the observed values in the task window match the following values within ±2 kΩ.

Table 4-18 Expected Impedance Values for EEG Electrodes

Electrode	Expected Value
EEG1+	5 kΩ
EEG1–	10 kΩ
EEG2+	12 kΩ
EEG2–	15 kΩ

6. If any value is outside the expected value range (±2 kΩ), please replace your EEG Module.

NOTE The Attenuation Factor of the Test Device is 10,000. In testing with a function generator, you must divide the generator amplitude reading by 10,000 or 5,000, depending on the generator used, to match the value on the CMS monitor.

7. If the problem persists, perform step 2 below.

Step 2 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears. If the problem still exists, replace the module.

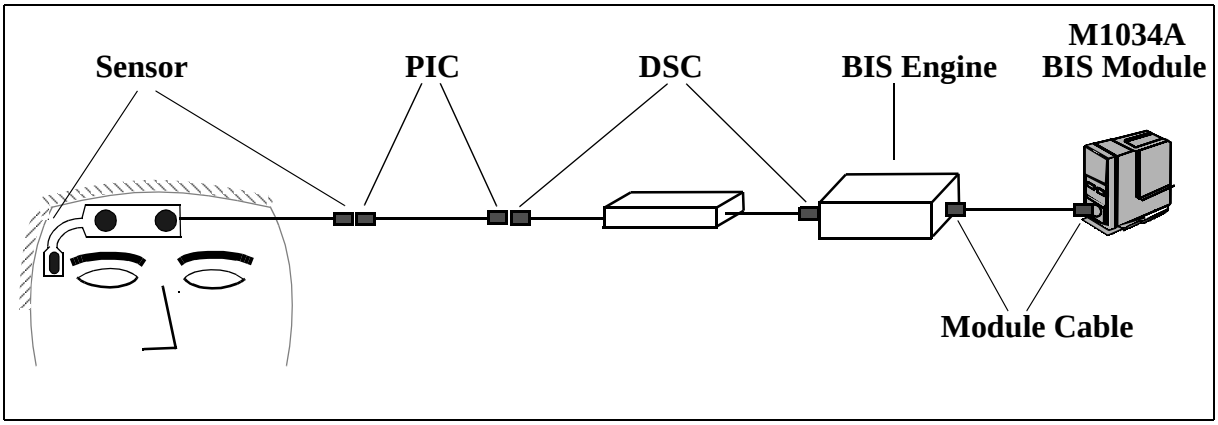
Table 4-19 INOP Messages for the EEG Module

INOP Message	Possible Cause	Corrective Action
EEG UNPLUGGED	EEG module is unplugged from the rack.	Perform Step 5 on page 4-40.
EEG EQUIP MALF	Malfunction in the EEG module hardware	Replace module.
EEG NO TRANSDUCER	EEG trunk cable disconnected from the module.	Connect EEG trunk cable to module. If INOP persists, replace EEG trunk cable. If INOP still persists, replace module.
EEG1 LEADS OFF EEG1 LEAD OFF XXX	Lead electrodes of channel EEG1 are not connected to or have fallen off the patient's head. If a single lead electrode is disconnected, the INOP is shown with the electrode location label (e.g. F3).	Connect channel 1 electrodes. Connect specified electrode (e.g. F3).
EEG2 LEADS OFF EEG2 LEAD OFF XXX	Lead electrodes of channel EEG2 are not connected to or have fallen off the patient's head. If a single lead electrode is disconnected, the INOP is shown with the electrode location label (e.g. F3)	Connect channel 2 electrodes. Connect specified electrode (e.g. F3).
EEG LEADS OFF	If multiple lead electrodes are not connected, this INOP is issued.	Connect electrodes properly (start with reference electrodes). If INOP is still displayed, replace leads. If INOP is still displayed, replace module.
EEG1 LINE NOISE EEG2 LINE NOISE	Excessive Line noise in channel EEG1 or EEG2	Keep all EEG cables together and away from metallic bodies, other cables and radiated fields.
EEG LINE NOISE	Excessive Line Noise in both channels at the same time.	Keep all EEG cables together and away from metallic bodies, other cables and radiated fields.
EEG1 OVERRANGE EEG2 OVERRANGE	Input signal is too high. This is usually caused by interfering signals such as line noise or electrosurgery.	Perform corrective action for INOP "EEG LINE NOISE". If INOP is still displayed, make sure that all electrodes are correctly attached.

Troubleshooting BIS Module Problems

This section describes how to troubleshoot and correct faults associated with the BIS components. The procedures for recognizing, isolating, and correcting faults using these components are as follows:

• Identifying a problem based on visual indications or repeated INOPS.



BIS Components Overview

To Troubleshoot the Module

❑ If **neither numerics nor a -?-** are displayed for the BIS module, perform the following actions:

Step 1 Make sure that BIS Engine, DSC and BIS Sensor are connected to the module. If not, connect the missing devices.

Step 2 Make sure the BIS parameter is turned on. Turn it on, if it is not.

Step 3 Make sure the BIS numeric is turned on. Turn it on, if it is not.

Step 4 Make sure you don't have more than one BIS module plugged into the module racks you are using. If more than one BIS module is plugged in, the supernumerary modules are ignored and should be removed.

Step 5 Check the connection on the module and the rack interface.

1. Unplug and re-plug the BIS module and check if the green LED on the BIS module lights up after re-plugging. If it does not, proceed with the following:
2. Put the BIS module into another slot and check the LED once again. If it lights up now, the connector for the previous slot is faulty and the rack needs to be replaced. If it does not, proceed with the following:
3. Note: this procedure applies only for setups, in which the BIS module is located in a Satellite Rack. If this does not apply for your situation,

proceed with 4.
Replace the cable from the Satellite Rack to the function box. Again unplug and re-plug the BIS module and check if the LED lights up. If it does not, proceed with the following:

4. Plug any other (not faulty) module into the same slot and check if the LED lights up. If the LED of the alternative module lights up, the BIS module is defect and has to be replaced. If it does not, either the rack or the rack interface card is defect. Proceed with the following:
5. Replace the rack and plug in the BIS module into the new rack. If the LED on the module does not light up, replace the rack interface card in the function box.

❑ If a **-?- instead of a numeric** and one or more INOP messages or a **small -?- in addition to a numeric** are displayed for the BIS module, perform the following actions:

Please note that for proceeding to the next steps a BIS Engine, DSC and BIS Sensor must be connected to the module.

Step 1 Refer to the following table. Correct the possible cause identified by the INOP message and verify that the INOP disappears.The order of the possible causes reflects their likelihood. Always start with the first to troubleshoot.

Table 4-20 INOP Messages for the BIS Module

INOP Message	Possible Cause	Corrective Action
BIS UN-PLUGGED	BIS module is unplugged from the rack.	Perform Step 5 on page 4-43
BIS MODULE MALFUNC	Malfunction in the BIS module hardware.	Enter BIS Task Window[1]. Look for the message “BIS Engine or DSC overcurrent”. If it is *not* displayed, replace BIS module.
	Overcurrent situation.	If it *is* displayed, perform the following procedure: Disconnect the BIS Engine from module and replug BIS module. If INOP persists, replace module. If INOP disappears, reconnect BIS Engine *without DSC* to module. If INOP persists, replace BIS Engine. If INOP disappears, reconnect DSC to BIS Engine. If INOP persists, replace DSC. If INOP disappears, replace Module Cable.
BIS ENGINE DISCONN	BIS Engine not connected.	Make sure that the Module Cable is properly connected.
	Module Cable defective.	If INOP persists replace Module Cable.

Table 4-20 INOP Messages for the BIS Module

INOP Message	Possible Cause	Corrective Action
BIS ENGINE INCOMPAT	BIS Engine Software is not supported.	A software upgrade may be required. Enter BIS Task Window[1] and write down the Revision numbers displayed for "Module FW Rev" and "BIS Eng SW Rev". Check the latest version of the compatibility matrix provided either on page 4-51 or in the latest Service Note, whichever is more recent.
BIS ENGINE MALFUNC	Malfunction in the BIS Engine hardware.	Replace BIS Engine.
BIS DSC DISCONN	DSC is not properly connected Either DSC cable or BIS Engine may be faulty.	Make sure that the DSC is properly connected to the adjacent devices. If INOP persists replace DSC[2]. If INOP persists replace BIS Engine.
BIS DSC MALFUNC	Electrocautery used during self-test. Malfunction in the BIS DSC hardware. PIC may be faulty.	Make sure not to use electrocautery during the self-test procedure. Perform a PIC/DSC Test as described under "General Test Procedures for the BIS components" on page 4-48. If it fails replace DSC[2]. If INOP persists replace PIC.
BIS DSC INCOMPAT	DSC is not supported by the BIS Engine or new DSC connected to an old BIS Engine.	A software upgrade may be required. Enter BIS Task Window[1] and note the Revision number displayed for "BIS Eng SW Rev" and the DSC ID. Check the latest version of the compatibility matrix provided either on page 4-51 or in the latest Service Note, whichever is more recent.
BIS SENSOR MALFUNC	Malfunction in the Sensor hardware, most often caused by liquids permeating into the connectors. PIC or short cable of the DSC may be faulty.	Replace Sensor. Enter BIS Task Window[1] and press "START CHECK" to initiate a Cyclic Impedance Check. Make sure all leads have passed the test. Make sure that the PIC connector (between PIC and Sensor) is dry. If you are not sure that the connector is dry, replace PIC until it has dried. If INOP persists perform the PIC/DSC Test as described under "General Test Procedures for the BIS components" on page 4-48. If it fails replace PIC. If INOP persists replace DSC[2].

Table 4-20 INOP Messages for the BIS Module

INOP Message	Possible Cause	Corrective Action
BIS SENSOR DISCONN	Sensor not properly connected to PIC and/ or PIC not properly connected to DSC. Sensor or PIC or short cable of DSC faulty.	Make sure that the BIS Sensor is properly connected to the PIC and the PIC is properly connected to the DSC. If INOP persists, perform a PIC/DSC Test as described under “General Test Procedures for the BIS components” on page 4-48. If it fails replace Sensor. If INOP persists replace PIC. If INOP persists replace DSC[2].
BIS SENSOR INCOMP	Unsupported Sensor connected or Sensor type unknown. PIC or short cable of the DSC may be faulty.	Make sure to use only Philips supported Sensors. Perform the PIC/DSC Test as described under “General Test Procedures for the BIS components” on page 4-48. If it fails replace PIC. If INOP persists replace DSC[2].
BIS SENSOR USAGE	Sensor expired due to too often usage. PIC or short cable of the DSC may be faulty.	Replace Sensor. Enter BIS Task Window. Make sure all leads have passed the Cyclic Impedance Check, which has been automatically performed. Perform the PIC/DSC Test as described under “General Test Procedures for the BIS components” on page 4-48. If it fails replace PIC. If INOP persists replace DSC[2].
BIS SQI < 15%	The signal quality is below 15% and the BIS value cannot be cacu-lated. This may occur as a result of artifact such as those generated from motion or the presence of electrocau-tery devices.	Make sure the Sensor is properly attached to the patient: Enter BIS Task Window[1] and press “START CHECK” to initiate a Cyclic Impedance Check. Make sure all leads have passed the test. Make sure the patient is completely relaxed (even small motions of the facial muscles affect the signal quality).
BIS IMPEDANCE CHCK	The Cyclic Impedance check is running.	Wait until Cyclic Impedance Check has finished or press “STOP CHECK” in the Cyclic Check Task Window.
BIS LEAD OFF	One or more leads (electrodes) have no skin contact.	Press the electrode pads firmly. If INOP persists, replace Sensor providing proper skin preparation.

Table 4-20 INOP Messages for the BIS Module

INOP Message	Possible Cause	Corrective Action
BIS HIGH IMPEDANCE	Impedance of one or more electrode(s) is above the valid range, most often caused by bad skin preparation. PIC or short cable of the DSC faulty.	Press the electrode pads firmly. If INOP persists, replace Sensor providing proper skin preparation. If INOP persists perform a PIC/DSC Test as described under "General Test Procedures for the BIS components" on page 4-48. If it fails replace PIC. If INOP persists replace DSC[2].
BIS ISOELECTRC EEG	No discernible EEG activity is detected for longer than 1 minute.	Check the patient. Check the leads for proper connection.
BIS SQI < 50%	The signal quality is below 50%. This may occur as a result of artifact such as those generated from motion or the presence of electrocautery devices.	Make sure the Sensor is properly attached to the patient: Enter BIS Task Window[1] and press "START CHECK" to initiate a Cyclic Impedance Check. Make sure all leads have passed the test. Make sure the patient is completely relaxed (even small motions of the facial muscles affect the signal quality).

1. To enter BIS Task Window press (in Monitoring Mode) MODULE SETUP followed by BIS
2. Before ordering a new DSC, try another one of the same type, if available.

General Test Procedures for the BIS components

PIC/DSC Test

TEST In Monitoring mode connect the **Sensor Simulator** (for maximum usage please refer to the documentation delivered with the Sensor Simulator) to the Patient Interface Cable (for part numbers please refer to Table 6-17 on page 6-26).

Enter the BIS Task Window by pressing **Module Setup**, followed by **BIS**.

Start Impedance Check by pressing **Start Check**. This brings up the BIS Cyclic Check Task Window. Check the displayed results.

RESULTS PIC and DSC are functioning correctly and the test is passed, if the following results are displayed:

Electrode	Expected Value
1	4-6 kΩ
2	8-12 kΩ
3	1-3 kΩ

If the test fails, firstly replace PIC with a known good one. Perform test again. If it fails again, DSC is faulty and has to be replaced.

NOTE If the DSC/PIC Test alternately passes and fails, this indicates a broken DSC cable. In this case you also have to replace the DSC.

DSC Self-Test

If the correct functioning of the DSC is in doubt, perform the DSC self-test.

NOTE The DSC and long cable only are covered by this test, not the short cable (which can be tested by the PIC/DSC Test described above).
This test is not available directly after connecting the DSC. Wait at least 10 seconds until the DSC has stabilized.
Do not run this test while electrocautery equipment is in use. This will cause a failure.

TEST Enter Service Mode

Enter the BIS Task Window by pressing **Module Setup**, followed by **BIS**.

Start Test by pressing **Test DSC**.

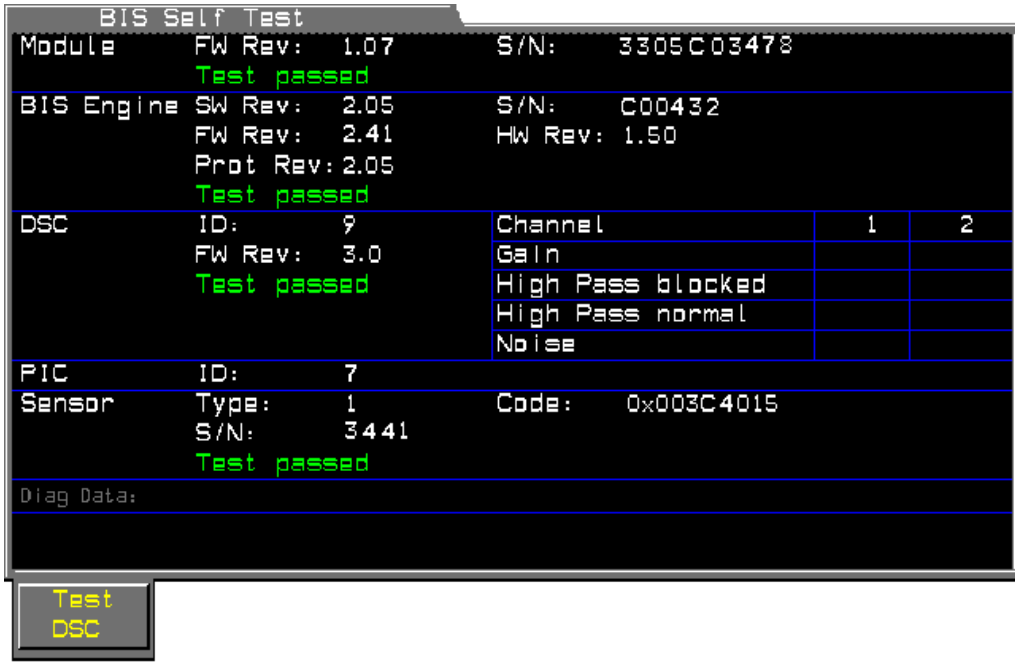
RESULTS DSC is functioning correctly and the test is passed with the following results displayed:

Module: **Test passed**
BIS Engine: **Test passed**
DSC: **Test passed**

The small table located right of the “DSC Test passed / failed” entry lists more detailed results of the DSC Self-Test.

Additional information available in the Service Mode Task Window

The Service Mode Task Window provides additional information, which is explained in the following section. To enter the window, change to Service Mode and press **Module Setup** followed by **BIS**. Please wait at least 10 seconds until all results are valid.
If the connected sensor has a malfunction (indicated by “Test failed” in the Sensor section of the Service Mode Task Window), in some cases it is necessary that you disconnect the sensor and un- and replug the module before continuing.



Note: the screen shown above is only an example and does not show real data.

For an explanation of the individual entries see next page.

Module		**DSC**	
FW Rev	Installed Firmware Revision of the BIS module.	ID	Type of DSC used. Supported types: 9 (DSC-3) & 10 (DSC-XP)
S/N[1]	Serial Number of the BIS module used.	FW Rev	Installed Firmware Revision of the DSC.
Test passed / failed	Result of the automatic BIS Self-Test[2].	Test passed / failed	Result of the automatic BIS Self-Test[b] as well as the manually started DSC Self-Test, described on page 4-46
BIS Engine		Gain High Pass blocked High Pass normal Noise	Detailed results of the DSC Self-Test.
S/N	Serial Number of the BIS Engine used.	**PIC**	
SW Rev	Installed Software Revision of the BIS Engine.	ID	With Sensor connected, the ID identifies the **class** of Sensors used. Supported classes: 7
Prot Rev	Protocol Revision of the BIS Engine used. Required for compatibility check between BIS Engine and BIS module.	**Sensor**	
FW Rev	Installed Firmware Revision of the BIS Engine.	S/N	Serial Number of the BIS Sensor used.
HW Rev	Hardware Revision of the BIS Engine used.	Code	Production related information.
Test passed / failed	Result of the automatic BIS Self-Test[b].	Type	**Type** of Sensor used. Supported types: 1 (Adult Patient Sensor Plus) 2 (Adult Patient Sensor XP) 3 (Pediatric Patient Sensor) 8 (Sensor Simulator - 1 channel) 9 (Sensor Simulator - 2 channel)
Diag data	Information for internal use only.	Test passed / failed	Result of the automatic BIS Self-Test[b].

1. If no number is shown behind S/N, please refer to the rear side of the BIS module.
2. Initiated by entering the Service Mode, switching Power On/Off or un-, replugging the BIS module.

Compatibility Matrix

The following table indicates the revisions of the BIS Module and BIS Engine that are allowed to be used with the various DSC, PIC and Sensor types. Only the fields marked with a ● indicate a valid combination. Due to the low update frequency of this manual it is likely that a more recent version of this matrix has already been issued via a Service Note. Always refer to the latest version.

		Module FW Rev	BIS Engine SW Rev	
		A.01.xx	1.xx	2.xx
DSC-3 ID	9	●	●	●
DSC-XP ID	10	●	--	●
PIC ID	7	●	●	●
Sensor type:				
Plus	1	●	●	●
XP	2	●	●	●
Pediatric	3	●	●	●
Simulator (1 Channel)	8	●	●	●
Simulator (2 Channel)	9	●	●	●

Troubleshooting VueLink Module Problems

NOTE For detailed troubleshooting information on the VueLink module, please refer to the documentation delivered with your external device driver.

For general testing of the VueLink module the following test procedure can be performed:

M1032A VueLink Tests using VueLink Test Module

The VueLink Test Module (part number M1186-60510) is a plug-in module used to test M1032A VueLink modules in the Philips CMS Patient Monitoring System.

Test Procedure

The following steps are the procedure for testing a VueLink module using the VueLink Test Module. In order to run the test, the Test Module must be preselected ON in Config Mode. This means that the Test Module must be one of the devices made available for selection during configuration of the VueLink Module.

The test itself is carried out in Monitoring Mode. For information concerning the configuration of VueLink modules see the M1032A VueLink Module Handbook (part number M1032-9000B).

Step 1 Plug the VueLink module into the module rack on the CMS.

Step 2 Press the Setup key on the front of the VueLink module.

Step 3 Press **Select Device** .

Step 4 In the window that appears, select “Test Module” using the **Next Device** softkey. It is important to note which device driver was previously selected, in order to be able to reset it at the end of the test. (It will be labeled on the front of the VueLink Module.)

Step 5 Press **Confirm** to store the selection and wait for the message “Switched to new device”.

Step 6 Plug in the Test Module.

Step 7 Connect the modules by plugging one end of the cable (part number M1032-61661) into the connector on the front of the VueLink Module, and the other end into the connector on the front of the Test Module.

Step 8 Press **Setup VueLink** to make the Test Module Task Window appear on the screen.
Note: The **Scale Wave** key is hollow and therefore cannot be selected.

The test module acts in the same way as an external device would, and sends signals to the VueLink module in both analog and digital form. The computer module checks these signals for validity, and then displays “passed” or “failed” on the screen.

The Task Window displays two waveforms, a triangular one and a rectangular one. These are displayed alternately and for a period of ten seconds each. The expected curve type is indicated below the wave.

There are two pairs of gridlines that indicate the permitted range for the max/min values of these waves. If all the data received by the test module is correct, the waves will lie within the specified ranges. If either limit of either wave falls outside the respective gridlines, then the module being tested is faulty regardless of the passed/failed messages.

The **Freeze Values** and **Update Values** softkeys are of no use in this test since **Freeze Values** would inhibit the update of the “Passed/Failed” messages.

When the test is complete:

Step 1 Disconnect the cable that joins the Test Module to the VueLink module.

Step 2 In Config Mode, ensure that the Test Module is set OFF, and the preselected devices are the same ones as before the test. Also, verify the settings for these devices.

Step 3 Return to Monitoring Mode.

Step 4 Press the Setup key on the front of the VueLink module and select the required device using the **Next Device** softkey.

NOTE It is important to ensure that the preselected device drivers are configured exactly the same as they were before the test (including default settings).

Performing Plug-In Module Self-Tests

The CMS contains auto-tests and self-tests that are designed to demonstrate that the monitor is interacting with the plug-in modules.

Objective

In order to meet the chapter's goals, you should be able to perform a plug-in module self-test and identify the normal outputs of a self-test.

Concepts

This Philips patient monitor has a module self-test which generates and displays test waveforms and corresponding numerics for all the modules that are connected through a rack and turned on. The test signals are displayed for about 30 seconds and then the display returns to the normal monitoring mode.

The self-test ensures that the system is functioning correctly; it does not troubleshoot the system.

The test signal will be displayed only if the system power-on sequence was successful and the module is plugged into a rack in the system and turned ON. Perform the following quick system check to verify that computer module, integral rack and plug-in modules are communicating properly before verifying the individual parameter modules.

Performing a Quick System Check

You can verify that the System board, integral rack and modules are communicating properly by completing the following test.

TEST Press the ECG key on the front of the ECG module in a system that is turned ON.

RESULT Pressing the ECG key brings up the ECG Task Window and verifies that the System board and integral rack are communicating with the plug-in module.

If the plug-in module Task Window, waveform or numeric is missing from the display, the module may not be turned ON. Try pushing the key on the plug-in module to see if the system is communicating with the module. If the ECG module does not respond, perform the module self-test.

To turn a parameter ON, press the following key sequence:

Module Setup or **Parameters** (if using Classic Control Panel)

→ **Parametr On/Off**

→ **Select Parametr**

→ **On/Off Setup**

Self-Test Procedure Overview

Step 1 Choose a patient category (Adult/Pedi/Neo) by pressing the following key sequence:

Module Setup or **Instrument Config** (if using Classic Control Panel

→ **Config Sets**

→ **Change Pat Categ**

Step 2 Display 30 seconds of the waveforms and numerics of all connected modules by pressing:

Monitor Setup (or **Instrument Config**)

→ **Test Signals**

Step 3 Repeat Step 2 as necessary to check the individual test waveforms and numerics for the category.

Step 4 Use Step 1 to choose a new patient category and repeat Steps 2 and 3.

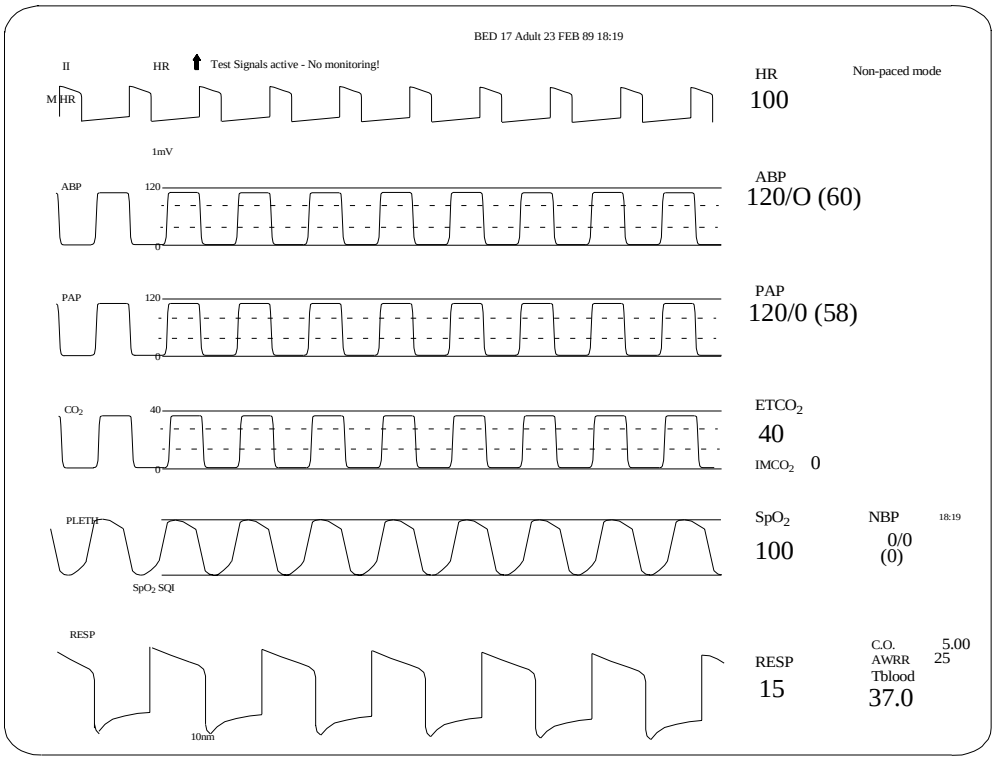
See the following table for test values.

Table 4-21 System Self-Test Values

Module	Test Numeric	Test Waveform
ECG	100 bpm in ADULT mode 125bpm in NEO/PED mode	Simulated Square Wave
RESP	15 rpm in ADULT mode 30 rpm in PEDI mode 55 rpm in NEO mode	Simulated Wave
Pressure Systolic	120 mmHg ADULT 60 mmHg PEDI/NEO	Simulated squarewave
Pressure Diastolic	0 mmHg ADULT 0 mmHg PEDI/NEO	Simulated squarewave
SpO_2	100%	No Wave
Pleth	Wave on display	Simulated wave
Cardiac Output Blood Temp Inj Temp	5 l/min (+0.1 l/min) 37°C 0°C	No wave
$tcpO_2$	60 mmHg (8.0 kPa)	No wave
$tcpCO_2$	40 mmHg (5.3 kPa)	No wave

Table 4-21 System Self-Test Values

Module	Test Numeric	Test Waveform
$ETCO_2$	40 mmHg (6.0 kPa)	Simulated squarewave
$IMCO_2$	0 mmHg (0.0 kPa)	Simulated squarewave
AWRR	25 rpm	
Temperature	40°C (104°F)	No wave



Example of an extended Self-Test display showing all possible waveforms

NOTE The following self-tests give the key sequence for the Standard Control Panel. If you are using a Classic Control Panel then you will use the **Instrument Config** hardkey instead of the **Monitor Setup** hardkey.

Performing the ECG or ECG/RESP Module Self-Test

Auto Check: None.

ECG test signals are rectangular pulses, which represent beat-to-beat heart rate, and are not the same as the ECG signals expected from a patient.

Self-Test: The ECG and ECG/RESP self-test may be performed at any time as the lead selector and pace pulse detection are inhibited during the check. The module will produce ECG test signals at the beginning of the processing circuitry, and process the test signals in the same way patient signals are processed. The test signals last about 30 seconds and then the display returns to the normal monitoring mode.

TEST Press **Monitor Setup** → **Test Signals**

RESULT If the module is functioning correctly, the following heart rate and respiration are displayed without the alarms being activated:

ECG	100 bpm in ADULT mode 125 bpm in NEO/PEDI mode
RESP	15 rpm in ADULT mode 30 rpm in PEDI mode 55 rpm in NEO mode

Performing the M1006A/B Pressure Module Self-Test

The pressure waveform provided is not the same as the waveform which would be expected from a patient.

Auto Check: The check for these modules is started every time the system is switched ON and checks the complete module circuitry, including the sensitivity detection circuit.

Self-Test: The test signals last about 30 seconds and then the display returns to the normal monitoring mode.

The M1006A Pressure self-test may be performed at any time as the input switch switches the CAL divider to 0 mmHg, and the pressure test signals bypass the sensitivity detection circuit. From here, the signals are processed in the same way as the patient signals.

The M1006B Pressure self-test may be performed at any time, as the signal is output from a microcontroller. From here, the test signal is processed in the same way as a patient signal, testing the complete signal path from the module to the display.

TEST Press **Monitor Setup** → **Test Signals**

RESULT If the module is functioning correctly, the following systolic and diastolic pressures are displayed without the alarms being activated:

Systolic	120 mmHg ADULT 60 mmHg PEDI/NEO
Diastolic	0 mmHg ADULT 0 mmHg PEDI/NEO

CAUTION **For the M1006A/B Pressure modules with analog output (Option #CO1), do not attempt defibrillation unless pump cable is connected at both ends or disconnected entirely. The signal to the balloon pump stops when a self-test is in progress or in Demo, Configuration or Service Modes.**

This module has no test waves or numerics.

Performing the NBP Module Self-Test

Auto Check: The NBP module performs a check periodically during operation.

Self-Test: None.

The SpO_2/Pleth test waveform is a Pleth rectangular wave which represents the signal from the photo-diode in the SpO_2 transducer assembly.

Performing the SpO_2/Pleth Module Self-Test

Auto Check: None.

Self-Test: The SpO_2/Pleth module self-test may be performed at any time. The integral waveform generator in the module produces test signals using the current driver at the beginning of the processing circuitry. The test signals are processed in the same way as patient signals are processed. The test signals last about 30 seconds and then the display returns to the normal monitoring mode.

TEST Press **Monitor Setup** → **Test Signals** .

RESULT If the module is functioning correctly, the following derived values and waveform are displayed without the alarms being activated:

SpO_2	100%
Pleth	Wave height after auto gain is 100% of scale height
Pulse Rate	100 bpm in ADULT mode 125 bpm in NEO/PEDI mode

This module only displays numerics.

Performing the Cardiac Output Module Self-Test

Auto Check: None.

Self-Test: The Cardiac Output module test may be performed at any time. The test signal lasts about 30 seconds and then the display returns to the normal monitoring mode.

TEST Press **Monitor Setup** → **Test Signals**

RESULT If the module is functioning correctly, the following derived values will be displayed without the alarms being activated:

C.O.	5.0 liters/min (±0.1 liters/min)
TBlood	37C ± 0.1C
Tinj	0C ± 0.1C

This module only displays numerics.

Performing the $tcpO_2$/$tcpCO_2$ Module Self-Test

Auto Check: The check is performed automatically when the system is switched on, during calibration, and continuously when no transducer is connected. When the auto check fails, the INOP message: `Equipment Malfunction` is given (refer to the Troubleshooting Chapter in this manual for troubleshooting details).

Self-Test: The $tcpO_2$/$tcpCO_2$ module self-test may be performed at any time. The test signal lasts about 30 seconds and then the display returns to the normal monitoring mode.

TEST Press **Monitor Setup** → **Test Signals**

RESULT If the module is functioning correctly, the following numerics are displayed without the alarms being activated:

$tcpO_2$	60 mmHg (8.0 kPa)
$tcpCO_2$	40 mmHg (5.3 kPa)

CAUTION **Radiated immunity: If operating under conditions according to EN 60601-1-2 up to 1 V/m electrical field strength, the following deviations in the measurements could occur: $tcpO_2$ 2 mmHg or less, $tcpCO_2$ 1 mmHg or less. It is recommended to avoid the use of electrically radiating devices in close proximity to a $tcpO_2$/ $tcpCO_2$ monitor.**

This module only displays a numeric.

Performing the SvO_2 Module Self-Test

Auto Check: None.

Please refer to the Abbott equipment documentation if a more detailed description of this procedure is required.

Self-Test: The module check may be performed at any time (on the Philips CMS Patient Monitoring System with Release D software and later releases) except during a calibration procedure. The test signals last about 30 seconds and then the display returns to the normal monitoring mode.

No SvO_2 test signal will be displayed if the Optical Module is disconnected from the plug-in module, or the main alarms are suspended.

TEST Press **Monitor Setup** → **Test Signals** .

RESULT If the module is functioning correctly, the following value is displayed without the alarms being activated:

SvO_2 70%

Performing the SvO_2 Optical Stability Check

Do not perform this check in an area of high level fluorescent lighting and avoid movement of the Optical Module during this procedure. Fluorescent lighting or movement could invalidate the stability check.

The following stability check procedure ensures the proper operation of Abbott's Optical Module (50131-04). Abbott recommends that this procedure is performed once a month. Although the Optical Module requires very little warm-up time to reach a stable operating temperature (for application purposes), Abbott recommends a warm-up time of approximately 15 minutes to ensure accurate stability check results.

Step 1 The following equipment set up is required: Philips CMS Patient Monitoring System with the SvO2 module plugged into the system rack and Abbott's 50131-04 Optical Module connected to the SvO2 module.

Step 2 Place the Optical Module out of direct light (for example, by covering it with a towel or drape). Ensure that the lid on the Optical Module is closed and that the "LOW LIGHT" INOP message is not displayed.

Step 3 Press the **CAL** key on the SvO2 module to enter the calibration Task Window.

Step 4 Press **Pre-Ins. Calibr.** and **Confirm** .

Step 5 The message CAL RUNNING will now be displayed for up to 1 minute. After 1 minute, this message is replaced by CAL MODE.

Step 6 The check is successful if the CAL MODE message remains displayed for 2 hours.

Step 7 The check is unsuccessful if the CAL MODE message is replaced with the CAL FAILED message within the 2-hour period.

Step 8 Repeat if the check was unsuccessful. If the check fails again, replace the Optical Module or contact your local Abbott service representative.

Performing the FIO_2 Module Self-Test

Auto Check: A continuous check of the **OFFSET** and **TEST** values is executed to ensure that they are within the specified limits. If one of these values is found to be outside its limit, a `FIO2 EQUIP MALF` message is displayed.

If the **BATTERY** values go outside the specified range, a `FIO2 BATTERY?` message is displayed. FIO_2 monitoring continues, but the backup feature of the module cannot be guaranteed, leading to a possible *drift* of the FIO_2 numeric.

Self-Test The manual check may be performed at any time. The check takes approximately 30 seconds, after which time the display automatically returns to the normal monitoring mode.

TEST Press **Monitor Setup** → **More Choices** → **Test Signals** .

RESULT If the module is functioning correctly the following numeric will be displayed without the alarms being activated:

FIO_2 0.21 (if no errors from the Auto-Test)

Performing the CO_2 Module Self-Test

Auto Check: None.

The simulated CO_2 wave is provided on the display with the numerics.

Self-Test: The self-test may be performed at any time. The test signals last about 30 seconds, and then the display returns to the normal monitoring mode.

TEST If a transducer is connected to the module, the following conditions must be met:

- The motor in the transducer is running.
- No heater malfunction is reported.

Press **Monitor Setup** → **Test Signals** .

RESULT If the module is functioning correctly the values will be displayed without the alarms being activated and should read as follows:

ET CO_2 40 mmHg (6.0kPa)

IMCO$_2$ 0 mmHg (0.0kPa)

AWRR 25 rpm

Performing the Temperature Module Self-Test

Auto Check: None.

This module only displays a numeric.

Self-Test: The Temperature module self-test may be performed at any time as the switch network switches to the reference resistors for the duration of the check. The system connects the reference resistors to the beginning of the processing circuitry, and processes this test value in the same way as the patient values are processed. The test signals last about 30 seconds and then the display returns to the normal monitoring mode.

TEST Press **Monitor Setup** → **Test Signals**.

RESULT If the module is functioning correctly, the following temperature will be displayed without the alarms being activated:

Temp 40 C (±0.1C)

Performing the Blood Analysis Module Self-Test

Auto Check: The Blood Analysis module performs a check when the system is switched on.

Self-Test: The Self-Test with the External Simulator M3634A may be performed at any time.

TEST Insert the External Simulator into the cartridge slot of the module.

RESULT Either PASS or FAIL will be displayed on the Monitor to indicate whether the module has passed the self-test or not. If the module fails the self-test, try the procedure again. If it fails again, wait half an hour and then try the procedure again. If the module continues to fail the self-test the module should be replaced.

Performing the Recorder Module Self-Test

Auto Check: The Recorder module performs a check when it is plugged in to the front-end rack of the system.

The recorder module produces a sequence of LED flashes when tested.

Self-Test: The Recorder module check may be performed at any time.

TEST Turn on the system power and plug in the recorder module.

RESULT The LED on the front panel indicates whether the module has passed the self-test by flashing.

- **Two flashes** Module has passed check.
- **One flash** Module failed self-test. Take the module out and try the procedure again to make sure there is a good connection.
- **No flash** Module processors are not working properly and the module should be replaced.

Refer to M1032A VueLink Module Handbook for further service details on the VueLink Modules.

Performing the VueLink Module Self-Test

Auto Check: The VueLink module performs an automatic check when the module is plugged in to the module rack of the system.

Self-Test: None.

Performing the Data Management Database Self-Test

The data management database is tested during system start-up with an SRAM checksum procedure. If there is an error found in the SRAM checksum, the system will restart (cold start) and all patient data will be lost.

Performing the RS-232 Card Loopback Test

An RS-232 Transmit/Receive (loopback) test can be performed to check both the transmit and the receive capabilities of the RS-232 ports. The test is performed as follows:

Step 1 Change to Service Mode.

Step 2 Connect the RS-232 cable (M1181A #A50 or #A51) directly from one of the RS-232 ports to the other on the same card.

Step 3 Ensure that all other connections to host computers are removed.

Step 4 Press **Monitor Setup** (or **Instrument Config**).

Step 5 Press **RS232**.

Step 6 Using the softkeys, configure both ports to:

- "Comp On"
- the same baud rate (for example: 19200)
- the same Tx/Rx byte order (for example: High/Low).

Step 7 Press **Store Settings** and then press **Confirm**.

Step 8 Press **Perform Test** to initiate the loopback test.

NOTE The message "RS232 port receive and transmit test passed" appears with "Port #1 <-> Port #2" if the test is successful; if not, the message "RS232 port transmit and receive test failed" appears. If the test is unsuccessful, both the cable and the RS-232 card should be examined and/or exchanged.

NOTE If you have two RS-232 boards in the monitor, you can also cross connect between the RS-232 boards. The message that appears could be "Port #1 <-> Port #4" if ports 1 and 4 are connected for the test.

Chapter 5 Repairing the CMS

This chapter explains how to remove and replace the assemblies that make up the CMS. Generally, you will be referred to this chapter to remove an assembly that is suspected to be faulty, or to replace an assembly as part of a hardware revision. In any event, this chapter describes how to disassemble the CMS to the point required to replace a selected assembly, gives any special tools required to do the job, and gives any cautions or warnings associated with the removal and replacement procedures.

Objective

In order to meet the chapter's goals, you should be able to locate and understand the removal and replacement procedures for the CMS.

Concepts

The CMS contains the following major units:

- Main Display Module – Main displays are 14" Mono, 14" Color or 10.4" Flatscreen color and provide a control panel for the human interface. Alternatively, you can have a 15" XGA-compatible display[1] as your main display (M1167A/77A Option H03) in which case the control panel is the separate Handheld Keypad with External Alarm Device.
- Slave/Independent Display Modules – Slave/Independent displays are 10.4" Flatscreen color, off-the-shelf XGA display[1], 14" Mono, 14" Color or 21" Color, and contain no control panel.
- Handheld Keypad (optional, except for M1167A/77A Option H03) – The handheld keypad is an input device used with the main display to interact with patient data management and drug calculator software.
- Computer Module – The computer module contains the hardware and software for the processing functions of the monitor. Most of the external connections of the monitor are in the rear of the computer module.
- Plug-in Module Rack (Integral or Satellite) – The plug-in module rack is the interface between the plug-in modules and the computer module. Module racks can be integrated in the computer module or remotely located in the patient vicinity.
- Plug-in Modules – The plug-in modules are the interface between the patient cables and the plug-in module rack. Each module is responsible for specific measurements. The number and type of modules used will depend on the monitoring situation.

1. Disassembly and repair of any off-the-shelf XGA display are outside the scope of this book. Refer to the manual that comes with the display. For details of the appropriate Safety Tests, see Chapter 2.

Procedure Overview

This chapter contains the following procedures:

Table 5-1 Procedure Overview for Removing and Replacing Parts

Assembly	Page
Display Module Overview	5-2
M1092A and M1094A Removal and Replacement Procedures	5-3
M1094B Removal and Replacement Procedures	5-22
M1095A Backlight Removal and Replacement Procedures	5-32
Handheld Keypad	5-39
External Alarm Device	5-40
Computer Module Removal and Replacement	5-44
Module Rack	5-61
Plug-in Modules	5-63

Each section that covers an assembly contains its own procedure overview.

Display Module Overview

Differences Between Models

The CMS is available under model numbers 54 through 68, the ACMS is available under model numbers 74 through 88 and the NCMS is available under model numbers 36 through 48.

The CMS / ACMS / NCMS models 3x, 5x and 7x use the M1092A Monochrome display. Model numbers 4x, 6x and 8x use the M1094B 14” Color display (or M1094A in older models), M1095A Flatscreen, or XGA-compatible display.

The procedures in this chapter are split into sections. The first section deals with the M1092A and M1094A displays modules, identifying differences as necessary. The second section deals with the M1094B display module. The third section deals with the M1095A Flatscreen display module.

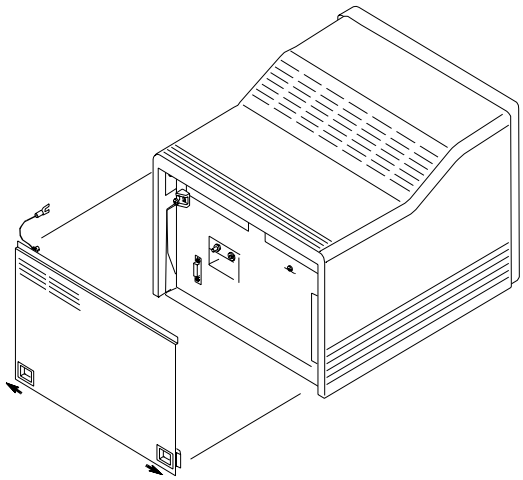
M1092A and M1094A Removal and Replacement Procedures

This section's procedures are listed in the following table. The procedures apply to both the M1092A (monochrome) and M1094A (color) monitors. Any differences are noted.

Table 5-2 Replaceable Parts for the CRT Display Module

Replaceable Part	M1092A go to Page	M1094A go to Page	M1094B go to Page
Rear Cover	5-4	5-4	5-22
Power Fail Relay (French ICU Option)	5-5	5-5	-
Power Fuses	5-6	5-6	5-23
Line Power Filter (M1094A Display)	-	5-8	-
Rear Enclosure	5-9	5-9	5-24
Locking Cam	5-10	5-10	5-25
Front Assembly	5-11	5-11	5-26
Human Interface Board	5-12	5-12	5-27
Membrane Switch	5-13	5-13	5-29
Metal Cover	5-14	5-14	5-30
Fuse Assembly	5-16	5-16	-
Switch-Mode Power Supply (M1092A)	5-18	-	-
Switch-Mode Power Supply (M1094A)	-	5-20	-
Switch-Mode Power Supply	-	-	5-31
Video/Philips-HIL Connector PCA	5-22	5-22	-

Rear Cover



To Remove the Rear Cover

No other assemblies need to be removed to remove the rear cover.

Step 1 Slide the two spring locks toward the center of the cover and lift the lower edge of the cover.

Step 2 Raise the cover so it is horizontal and slide the cover directly out of the rear of the display.

Step 3 Lean the cover against the side of the display such that you can see the ground connection to the case.

Step 4 Using a cross-tipped screwdriver, remove the large grounding screw from the inside of the display's left panel. Make sure that you retain the two washers.

To replace the Rear Cover

Step 1 Lean the cover against the rear of the display such that you can connect the ground wire to the case of the display.

Step 2 Using a cross-tipped screwdriver, replace the large grounding screw on the inside of the display's left panel. Make sure that you replace the two washers on either side of the cable eyelet.

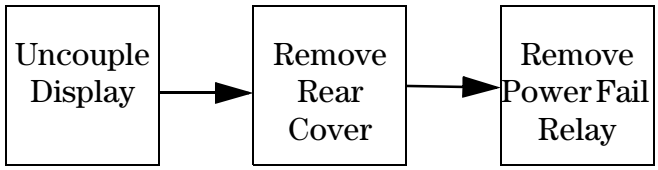
Step 3 Holding the cover horizontally, slide the cover into the top of the display and lower the free edge of the cover to the vertical.

Step 4 Push the bottom of the cover firmly into place and the two spring locks *click* to lock the cover into place.

Power Fail Relay (French ICU Option)

To remove the Power-fail Relay (French ICU Option)

The work-flow for removing the power-fail relay is as follows:



Step 1 Using a cross-tipped screwdriver, remove the screw from the bottom of the relay. This secures the relay to the metal top cover.

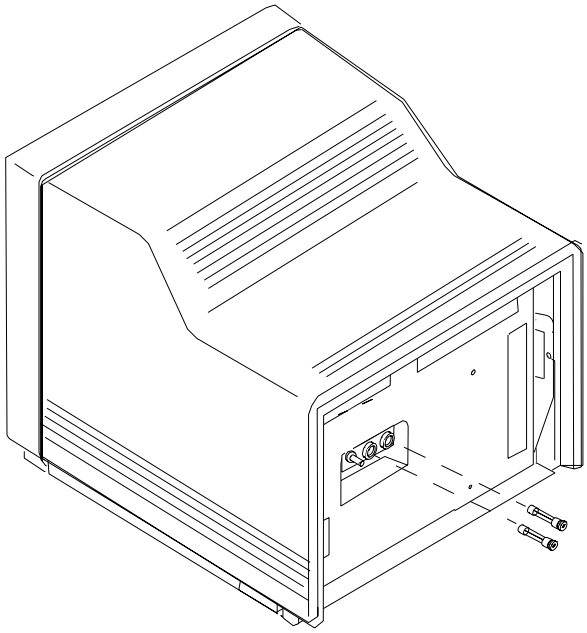
Step 2 Use the flange of metal to pull the relay directly out of the IEC power connector on the rear of the display.

To replace the Power-fail Relay (French ICU Option)

Step 1 Locate the relay in the cavity by the IEC power connector on the rear of the display and push firmly home.

Step 2 Using a cross-tipped screwdriver, replace the screw on the bottom of the relay. This secures the relay to the metal top cover.

Power Fuses



The power fuses provide over-voltage protection to the input line voltage circuitry. They are generally removed for inspection. If the fuses are bad (blown), they can only be replaced by the same type of fuse with an identical rating. Table 1 shows the fuse ratings.

To Remove the Power Fuses

No other assemblies need to be removed to remove the Power Fuses.

Step 1 Using a flat-bladed screwdriver, turn the fuse cap a quarter turn counter-clockwise. The fuse cap should spring slightly from the rear of the display.

Step 2 Pull the fuse cap and fuse clear of the display.

Step 3 Pull the fuse out of the fuse cap and inspect it for a blown condition. If you are unsure, use an ohmmeter to measure the resistance of the fuse. If the fuse reads anything other than a short, the fuse is bad and needs to be replaced.

Step 4 Repeat steps 1 through 3 for the other fuse.

Table 5-3 Fuse Ratings for M1092A and M1094A Displays

Display	Fuse	Part Number
M1092A	T4A, UL 110V	242208601263FMI
M1092A	T2A, VDE 220V	242208625096FMI
M1092A	T2A, UL 220V	242208601266FMI
M1094A	T4A, UL 110V	242208601263FMI
M1094A	T2.5A, UL 220V	242208610009FMI
M1094A	T2.5A, VDE 220V	242208610219FMI

To replace the Power Fuses

Only use a fuse of the correct rating.

Step 1 Place one end of the fuse, of the correct value, into the fuse cap.

Step 2 Place the fuse and fuse cap into the receptacle in the rear of the display.

Step 3 Using a flat-tipped screwdriver, gently push the fuse cap into the display.

Step 4 Hold the fuse cap into the display and turn the fuse cap a quarter-turn clockwise.

Step 5 Repeat for the other fuse.

Line Power Filter (M1094A Display)

To remove the Line Power Filter (M1094A Display)

WARNING **LETHAL HAZARD FROM ELECTRIC SHOCK**

This is part of a filtered power supply. This filter can store lethal voltage levels for several minutes after the power is removed. You must allow the filter to rest for at least 10 minutes without power applied before removing it.
You must use a screwdriver with an insulated shaft.



Step 1 Using a cross-tipped screwdriver, remove the two screws from the top and the bottom of the filter cover.

Step 2 Remove the filter cover to expose the filter and its connections. Make a note or sketch of the connections for installing the replacement.

Step 3 Remove the filter connections to the line voltage and the integral switch-mode power supply.

Step 4 While supporting the filter, use the cross-tipped screwdriver to remove the four screws that secure the filter to the display rear enclosure.

Step 5 Lift the filter clear of the display rear enclosure.

To replace the Line Power Filter (M1094A Display)

Step 1 Place the power filter over the four holes on the display rear panel.

Step 2 Support the filter and locate the top screw on each side of the filter.

Step 3 Replace the other two screws and tighten to secure it to the display rear panel.

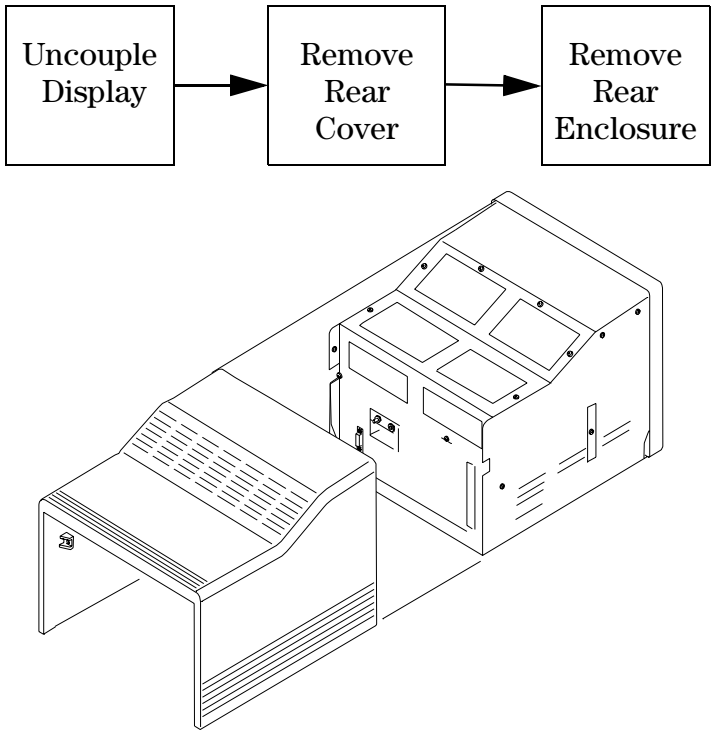
Step 4 Replace the filter connections as you noted them during the removal.

Step 5 Locate the filter cover over the two holes on the display rear cover.

Step 6 Replace the two screws and tighten to secure the cover in place.

Rear Enclosure

To remove the Rear Enclosure



Step 1 Using a cross-tipped screwdriver, remove the two screws securing the Rear Enclosure to the display rear panel.

Step 2 Grip the sides of the Rear Enclosure and slide it toward the rear of the display until it stops.

Step 3 Grip the inside lower edges of each side of the Rear Enclosure and spring them outward and lift the Rear Enclosure clear of the display.

To Replace the Rear Enclosure

Step 1 Grip inside the lower edges of each side of the Rear Enclosure, with the back towards you, and spring them outward.

Step 2 Lower the Rear Enclosure over the top of the display module so it is an inch away from the Front Assembly.

Step 3 Grip the sides of the Rear Enclosure and slide it toward the front of the display module until it clicks into place.

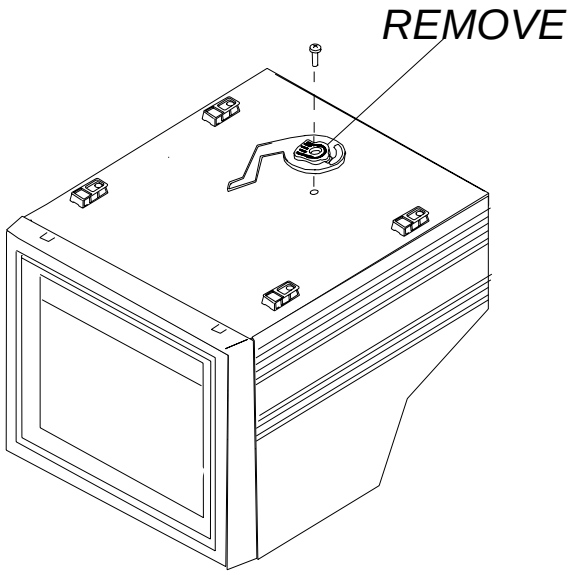
Step 4 Using the cross-tipped screwdriver, replace the two screws securing the Rear Enclosure to the display rear panel.

Locking Cam

This is the locking cam which holds the display to the computer module or to a mount.

No other assemblies need to be removed to remove the Locking Cam.

To remove the Locking Cam



Step 1 Lay the display face down on a soft surface.

Step 2 Remove the mounting screw using a number 1 Pozidrive screwdriver. The locking cam can now be removed from the display.

To replace the Locking Cam

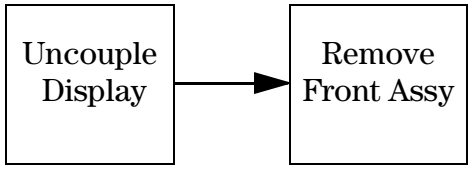
Step 1 Lay the display face down on a soft surface.

Step 2 Place the locking cam over the mounting hole so it points toward the rear of the unit.

Step 3 Using a number 1 Pozidrive screwdriver, secure the locking cam to the display with the mounting screw.

Front Assembly

To remove the Front Assembly/Plastic Bezel



Retain Front Assembly/Plastic Bezel if sending CRT back to the factory.

Step 1 Place the display module on its back, with its feet toward you.

Step 2 Using the cross-tipped screwdriver, slacken the two securing screws on the bottom edge of the Front Assembly.

Step 3 Using a flat-blade screwdriver, spring the plastic tabs toward you and tilt the front of the Front Assembly an inch clear of the screen.

Step 4 Remove the ribbon cable connector from the human interface board in the bottom of the Front Assembly. If present, remove the GND cable clamp from the metal cabinet.

Step 5 Lift the Front Assembly clear of the screen.

To replace the Front Assembly

Step 1 Place the display module on its back, with its feet towards you.

Step 2 Locate the four plastic tabs at the top of the Front Assembly into the holes in the top of the display module. Lower the bottom edge of the Front Assembly to within two edges of the screen.

Step 3 Connect the ribbon cable to the human interface board in the bottom of the Front Assembly, noting the orientation of the keyed connector.

Step 4 If present, connect the GND cable clamp to the metal cabinet.

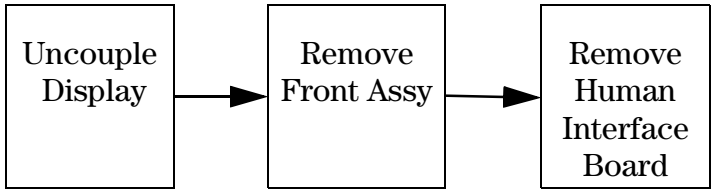
Step 5 Lower the Front Assembly on to the screen, making sure to align the hole in the Front Assembly with the plastic stud of the power switch. Push firmly so the plastic lugs snap on to the display module.

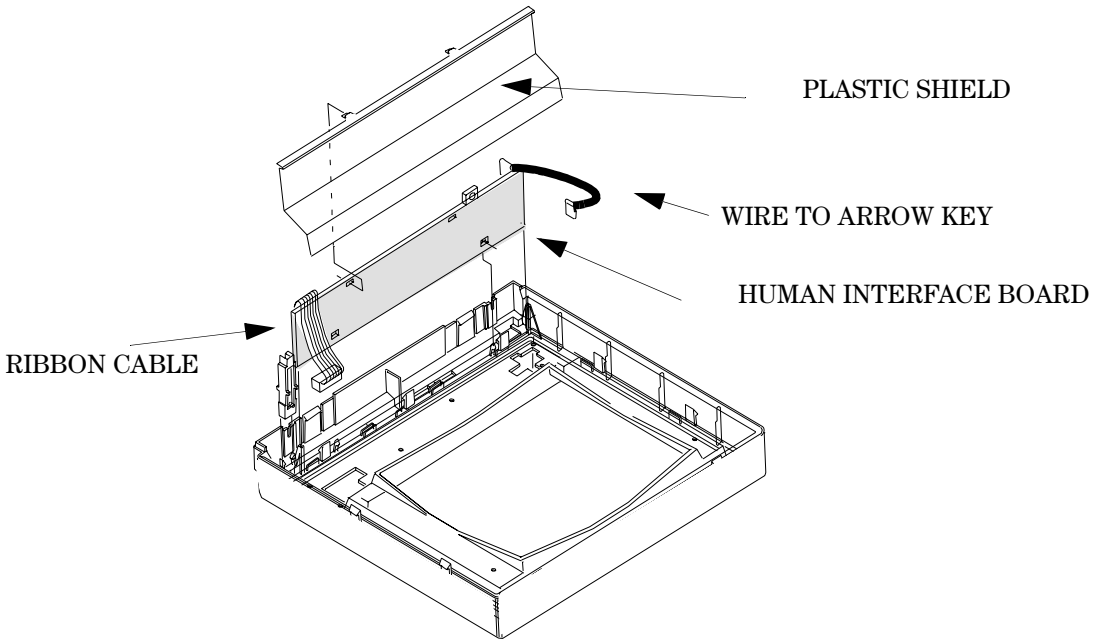
Step 6 Using the cross-tipped screwdriver, tighten the two securing screws on the bottom edge of the Front Assembly.

Step 7 Lower the front of the display so that it stands upright.

Human Interface Board

To remove the Human Interface Board





Step 1 Remove the plastic shield by pushing the two plastic tabs through the retaining holes on the Human Interface Board.

Step 2 Remove the ribbon connector from the Membrane Switch.

Step 3 Lean over to view the other side of the board and find the three square holes in the board that accept the plastic securing lugs.

Step 4 Using a flat-tipped screwdriver, lightly spring each lug in turn while gently pulling the top edge of the board.

Step 5 Disconnect the wire from the ARROW key.

Step 6 When the lugs are free, lift the board vertically out of the Front Assembly, clear of the Membrane Switch.

To replace the Human Interface Board

Step 1 Locate the lower edge of the interface board into the slots on either side of the Front Assembly.

Step 2 Align the LED with the hole in the Front Assembly, as you place the board into the slots.

Step 3 Push the board firmly so the three plastic lugs engage.

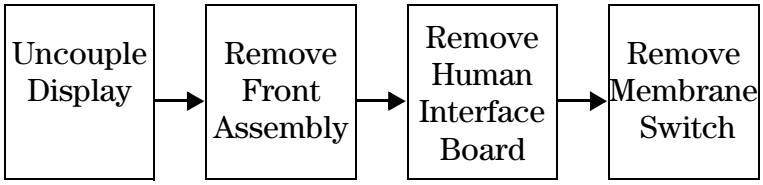
Step 4 Reconnect the ribbon connector into the Membrane Switch.

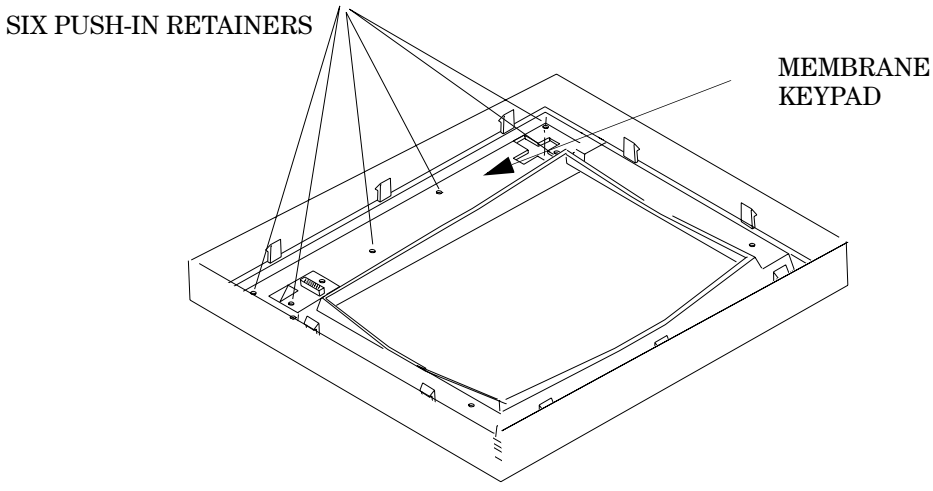
Step 5 Reconnect the wire to the ARROW key.

Step 6 Align the plastic tabs of the plastic shield with the retaining holes on the Human Interface Board and push the plastic shield until it snaps into place.

Membrane Switch

To remove the Membrane Switch





Step 1 Remove the ribbon cable from the keypad.

Step 2 Lay the Front Assembly flat on a table with the back of the Front Assembly uppermost.

Step 3 Using the screwdriver, remove the six push-in retainers.

Step 4 While pushing on the central threaded post, lift the Front Assembly clear of the keypad.

To replace the Membrane Switch

Step 1 Lay the keypad on a table with the threaded post facing up.

Step 2 Lower the threaded posts through the holes in the Front Assembly.

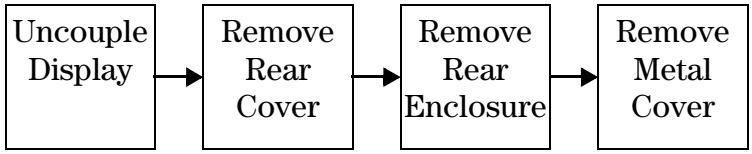
Step 3 Replace the six push-in retainers. These secure the keypad to the Front Assembly.

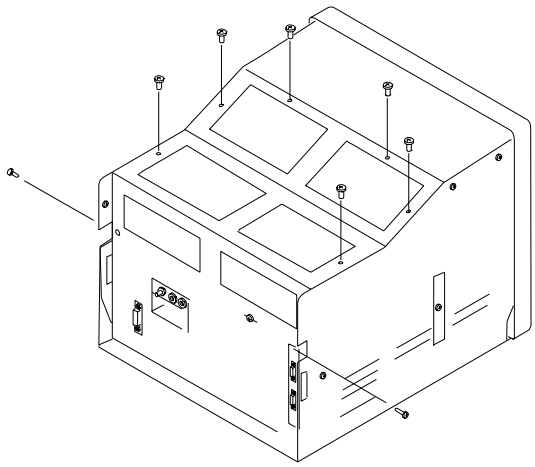
Step 4 Connect the ribbon cable to the keypad.

Metal Cover

The Metal Cover is not a field replaceable assembly. Its removal and replacement is included here because it must be removed to remove other assemblies internal to the display.

To remove the Metal Cover





Step 1 Using a cross-tipped screwdriver, remove the eight screws securing the metal cover to the display.

Step 2 For the M1094A (color) display, lift the top of the cover and pass the connector to the line filter through the holes in the rear of the cover.

Step 3 Lift the cover from the display.

To replace the Metal Cover

Step 1 For the M1094A (color), support the cover to the rear of the display and pass the connectors to the line filter through the holes in the rear of the cover. The three connectors from the main inlet connector are passed through the left hole and the two load connectors to the SMPS are passed through the lower right hole.

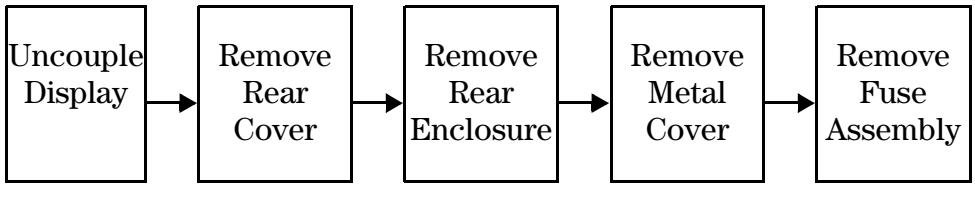
Step 2 Locate the cover on the display so the holes in the cover and display are aligned.

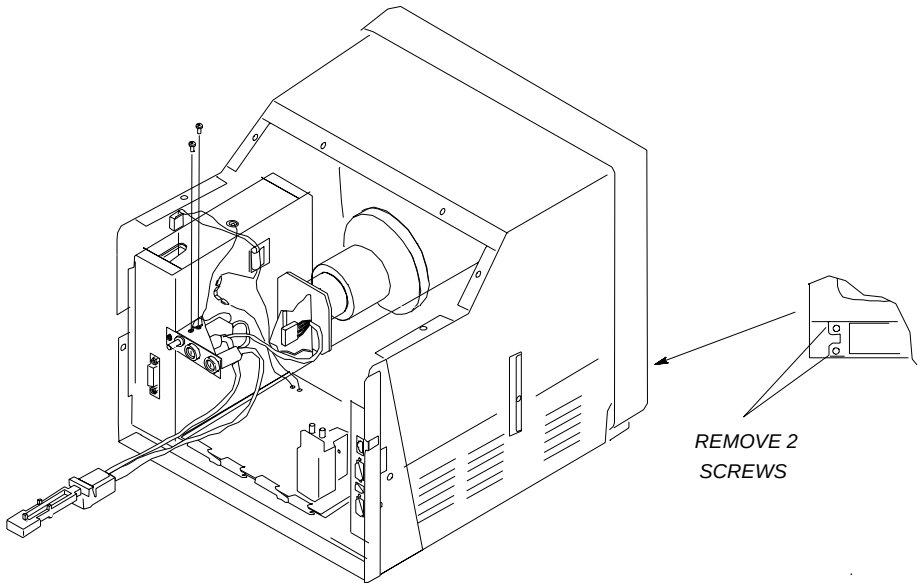
Step 3 Replace the eight screws to secure the cover to the display.

Fuse Assembly

To remove the Fuse Assembly

For the M1092A Display, the power connector and the power switch are part of the fuse assembly. They are removed when the fuse assembly is removed. The power connector is not a field replaceable item so there is no further maintenance on it.





Step 1 Using a cross-tipped screwdriver, remove the two screws securing the two green and yellow striped wires from the switch-mode power supply and deflection board to the common ground point on the plate of the assembly. Note there are two washers for each lead, one below and one above the lead.

Step 2 Remove the screw securing the single grounding wire to the common ground point.

Step 3 For the M1092A (monochrome) display only, remove the power connection from the rear of the SMPS.

Step 4 For the M1092A (monochrome) display only, go to the front of the display and, using a cross-tipped screwdriver, remove the two screws securing the power switch to the left of the display front panel.

Step 5 Pass the power switch into the body of the display and pull it out from the rear of the display.

Step 6 Remove the screw on the left of the grounding post on the rear of the SMPS. This secures the assembly to the power supply.

Step 7 Slide the assembly out of the slot in the side of the power supply.

To replace the Fuse Assembly

Step 1 Slide the assembly into the two slots on the right side of the SMPS.

Step 2 Secure the assembly to the SMPS using one screw.

Step 3 For the M1092A (monochrome) display only, pass the power switch from the rear of the display to the left of the front panel.

Step 4 For the M1092A (monochrome) display only, at the front of the display, use a cross-tipped screwdriver to secure the power switch to the display front panel using two screws.

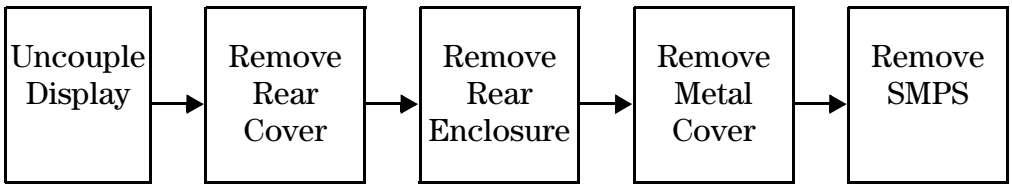
Step 5 For the M1092A (monochrome) display only, connect the power connector to the rear of the SMPS.

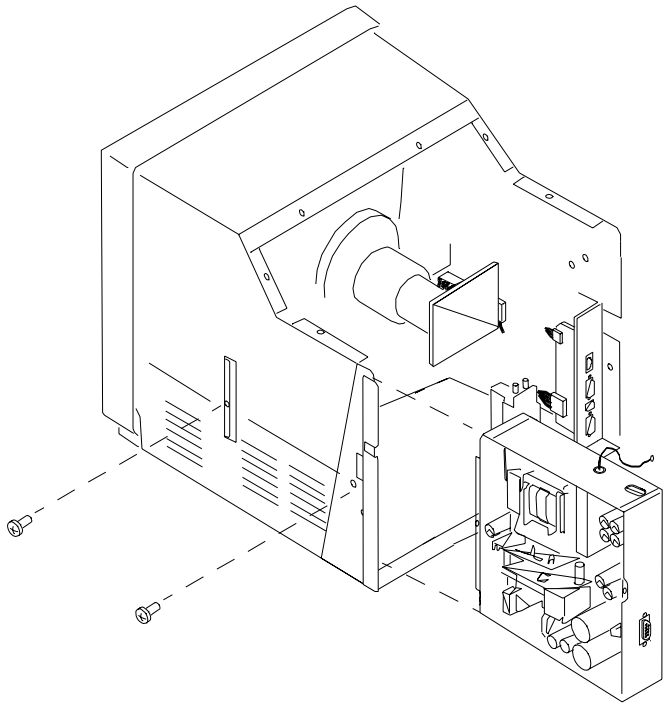
Step 6 Secure the single grounding wire to the common ground point using one screw.

Step 7 Secure the two green and yellow wires from the SMPS and the deflection board to the common ground point using one screw and two washers for each lead. One washer goes above the lead and one washer goes beneath the lead.

Switch-Mode Power Supply (M1092A)

To remove Switch-Mode Power Supply (SMPS)





Step 1 Remove the power connector (red and black wires) for the human interface board from the top of the SMPS.

Step 2 Remove the power connector (orange and black wires) for the deflector board from the top of the SMPS.

Step 3 Remove the black wire for from the plug-in spade terminals on the SMPS cover.

Step 4 Using a cross-tipped screwdriver, remove the two screws from the outside of the display's left panel. These screws secure the SMPS to the display module.

Step 5 Slide the SMPS toward the rear of the display to access the power connector on the front of the SMPS. Disconnect the connector.

Step 6 Lift the SMPS from the display.

To replace the SMPS

Step 1 Hold the SMPS with the 15-pin D-type connector toward you and the open part of the SMPS case to your left.

Step 2 Place the SMPS into the display module so that you can make the power connection on the front side of the SMPS.

Step 3 Connect the connector to the plug on the front side of the SMPS.

Step 4 Slide the SMPS into the slot on the left side of the main casing of the display module. The holes in the SMPS and the left panel of the display module should be aligned.

Step 5 Using a cross-tipped screwdriver, secure the SMPS to the display's left panel using two screws.

Step 6 Connect the black wires to the plug-in spade terminals on the SMPS.

Step 7 Connect the power connector (orange and black wires) for the deflector board to the top of the SMPS.

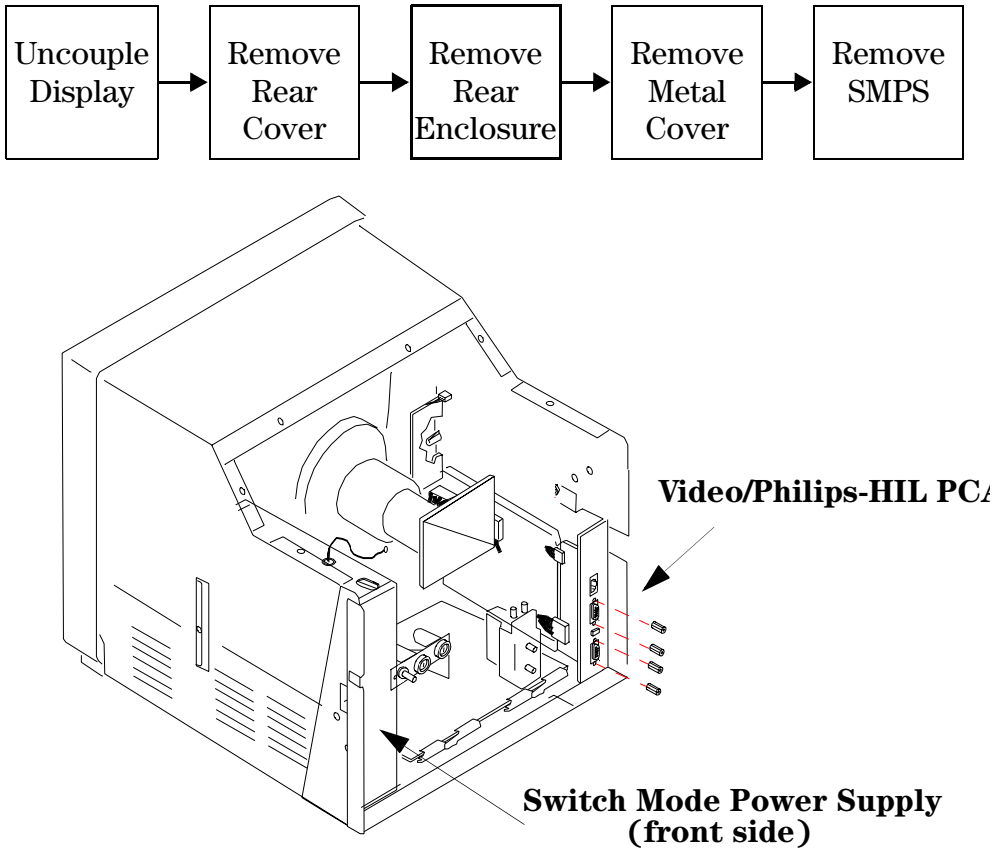
Step 8 Connect the power connector (red and black wires) for the human interface board to the top of the SMPS.

WARNING **When you remove or replace a power supply, you MUST perform the required safety test(s) before the equipment is used again for monitoring.**

See Chapter 2 for details of the safety tests.

Switch-Mode Power Supply (M1094A)

To remove Switch-Mode Power Supply (SMPS)



Step 1 Remove the power connector (red and black) wires for the human interface board from the top of the SMPS.

Step 2 Using a cross-tipped screwdriver, remove the two screws from the outside of the display's left panel. These screws secure the SMPS to the display module.

Step 3 Slide the SMPS toward the far end of the display to access the connectors on the rear of the SMPS.

Step 4 With the top connector being number 1, remove connectors 1 and 3 by pulling them out. Remove connector 2 by pressing the two flaps on either side of the cable-end connector and pull out. Spring the locking flap of connector 4 to allow the connector to be removed.

Lift the SMPS clear of the display module.

To Replace the SMPS

Step 1 Hold the SMPS with the 15-pin D-type connector toward you and the open part of the SMPS case to your left.

Step 2 Place the SMPS into the display module so that you can make the connection on the front side of the SMPS.

Step 3 Replace the connectors by pushing them in receptacles of the correct color and shape.

Step 4 Place the SMPS in the display so the holes in both the SMPS and the left panel of the display are aligned.

Step 5 Using a cross-tipped screwdriver, secure the SMPS to the display's left panel using two screws.

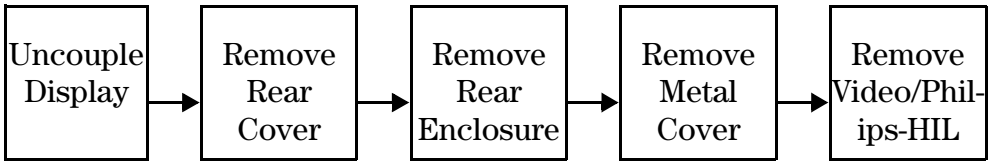
Step 6 Connect the power connector (red and black wires) for the human interface board to the top of the SMPS.

WARNING **When you remove or replace a power supply, you MUST perform the required safety test(s) before the equipment is used again for monitoring.**

See Chapter 2 for details of the safety tests.

Video/Philips-HIL Connector PCA

To remove the Video/Philips-HIL Connector PCA



See previous graphic to locate the Video/Philips-HIL Connector PCA

Step 1 Unplug the two connectors from the video card.

Step 2 Using a socket driver, remove the four hex studs from the plate.

Step 3 Lift the connector plate clear of the display.

To replace the Video/Philips-HIL Connector PCA

Step 1 Place the connector plate over the four mounting holes.

Step 2 Using a socket driver, secure the plate using the four hex studs.

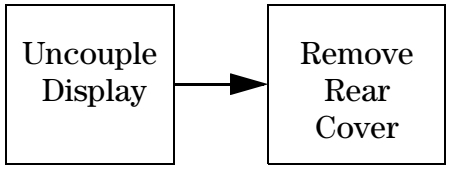
Step 3 Plug the two connectors to the video card.

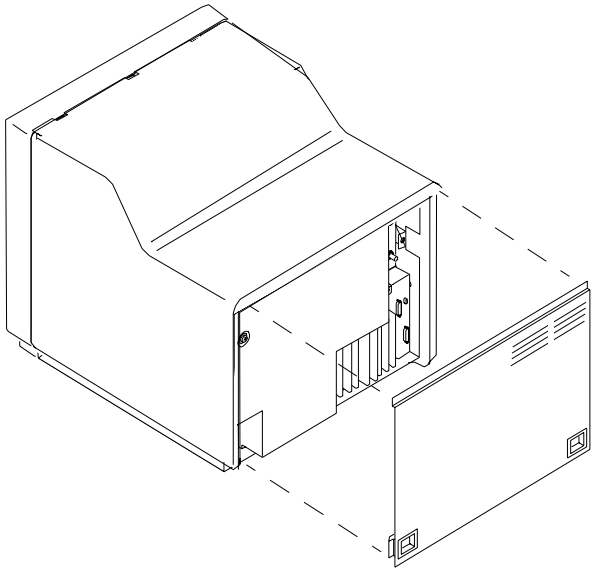
M1094B Removal and Replacement Procedures

The following procedures apply for the M1094B (color) monitor.

Rear Cover

To remove the Rear Cover





You do not need any special tools to remove the rear cover. It can be removed using a cross-tipped screwdriver.

No other assemblies need to be removed to remove the rear cover.

Step 1 Slide the two spring locks toward the center of the cover and lift the lower edge of the cover.

Step 2 Raise the cover so it is horizontal and slide the cover directly out of the rear of the display.

Step 3 Lean the cover against the side of the display such that you can see the ground connection to the case.

Step 4 Lean the cover against the side of the display such that you can see the ground connection to the case.Using a cross-tipped screwdriver, remove the large grounding screw from the inside of the display's left panel. Make sure that you retain the two washers.

To replace the Rear Cover

Step 1 Lean the cover against the rear of the display such that you can connect the ground wire to the case of the display.

Step 2 Using a cross-tipped screwdriver, replace the large grounding screw on the inside of the display's left panel. Make sure that you replace the two washers on either side of the cable eyelet.

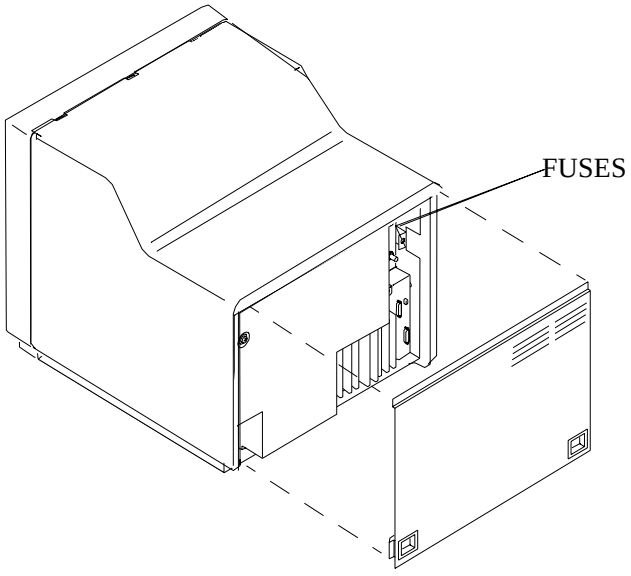
Step 3 Holding the cover horizontally, slide the cover into the top of the display and lower the free edge of the cover to the vertical.

Step 4 Push the bottom of the cover firmly into place and the two spring locks “click” to lock the cover into place.

Power Fuses

To Remove the Power Fuses

The power fuses provide over-voltage protection to the input line voltage circuitry. They are generally removed for inspection. If the fuses are bad (blown), they can only be replaced by the same type of fuse with an identical rating. Table 2 shows the fuse ratings for the M1094B.



The power fuses provide over-voltage protection to the input line voltage circuitry. They are generally removed for inspection purposes. If the fuses are bad (blown), they can only be replaced by the same type of fuse with an identical rating. The fuses are removed using a flat-bladed screwdriver.

Step 1 Using a flat-bladed screwdriver, turn the fuse cap a quarter turn counter-clockwise. The fuse cap should spring slightly from the rear of the display.

Step 2 Pull the fuse cap and fuse clear of the display.

Step 3 Pull the fuse out of the fuse cap and inspect it for a blown condition. If you are unsure, use an ohmmeter to measure the resistance of the fuse. If the fuse reads anything other than a short, the fuse is bad and needs to be replaced.

Step 4 Repeat steps 1 through 3 for the other fuse.

To replace the Power Fuses

Table 5-4 Fuse Ratings for M1094B Display

Display	Fuse	Part Number
M1094B	T4A, UL 110V	242208601263FMI
M1094B	T3.15A, VDE or UL 220V	242208610239FMI

Only use a fuse of the correct rating.

Step 1 Locate one end of the fuse of the correct value into the fuse cap.

Step 2 Locate the fuse and fuse cap into the receptacle in the rear of the display.

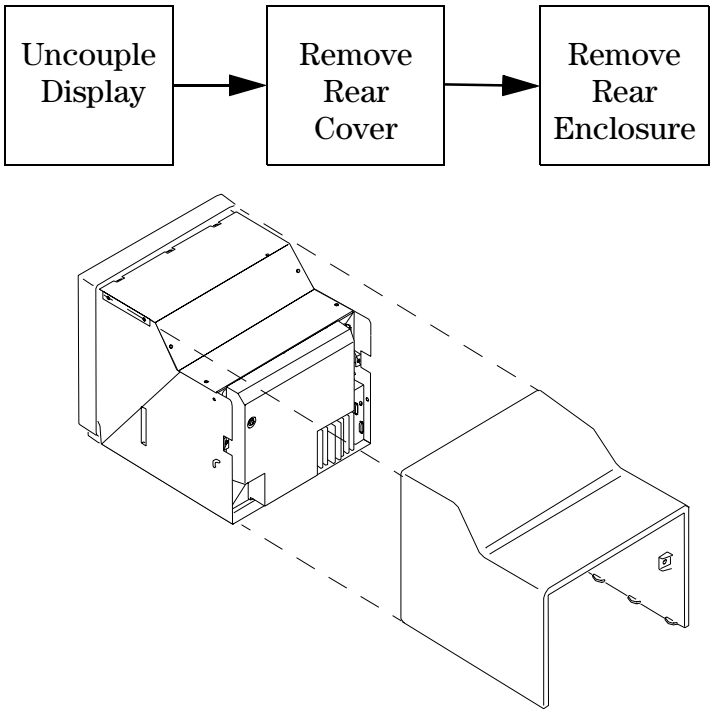
Step 3 Using a flat-tipped screwdriver, gently push the fuse cap into the display.

Step 4 Hold the fuse cap into the display and turn the fuse cap a quarter-turn clockwise.

Step 5 Repeat for the other fuse.

Rear Enclosure

To remove the Rear Enclosure



Step 1 Using a cross-tipped screwdriver, remove the two screws securing the Rear Enclosure to the display rear panel.

Step 2 Grip the sides of the Rear Enclosure and slide it towards the rear of the display until it stops.

Step 3 Grip the inside lower edges of each side of the Rear Enclosure and spring them outward and lift the Rear Enclosure clear of the display.

To replace the Rear Enclosure

Step 1 Grip inside the lower edges of each side of the Rear Enclosure, with the back towards you, and spring them outward.

Step 2 Lower the Rear Enclosure over the top of the display module so it is an inch away from the front Front Assembly.

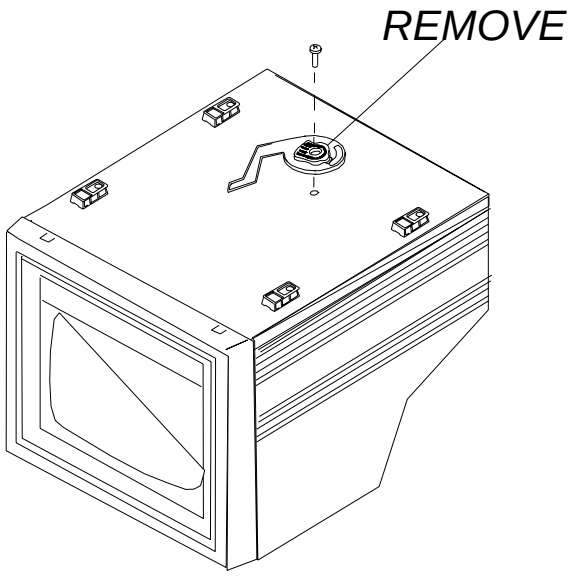
Step 3 Grip the sides of the Rear Enclosure and slide it toward the front of the display module until it clicks into place.

Step 4 Using the cross-tipped screwdriver, replace the two screws securing the Rear Enclosure to the display rear panel.

Locking Cam

This is the locking cam which holds the display to the computer module or to a mount.

To remove the Locking Cam



Step 1 Lay the display face down on a soft surface.

Step 2 Remove the mounting screw using a number 1 Pozidrive screwdriver. The locking cam can now be removed from the display.

To replace the Locking Cam

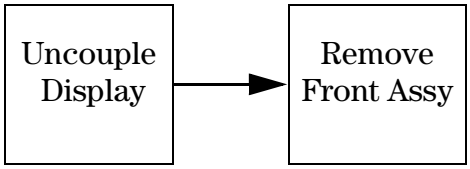
Step 1 Lay the display face down on a soft surface.

Step 2 Place the locking cam over the mounting hole so it points towards the rear of the unit.

Step 3 Using a number 1 Pozidrive screwdriver, secure the locking cam to the display with the mounting screw.

Front Assembly

To remove the Front Assembly



Step 1 Place the display module on its back, with its feet towards you.

Step 2 Using the cross-tipped screwdriver, slacken the two securing screws on the bottom edge of the Front Assembly.

Step 3 Using a flat-blade screwdriver, spring the plastic tabs towards you and tilt the front of the Front Assembly an inch clear of the screen.

Step 4 Remove the ribbon cable connector from the human interface board in the bottom of the Front Assembly. If present, remove the GND cable clamp from the metal cabinet.

Step 5 Lift the Front Assembly clear of the screen.

To replace the Front Assembly

Step 1 Place the display module on its back, with its feet towards you.

Step 2 Locate the four plastic tabs at the top of the Front Assembly into the holes in the top of the display module. Lower the bottom edge of the Front Assembly to within two edges of the screen.

Step 3 Connect the ribbon cable to the human interface board in the bottom of the Front Assembly, noting the orientation of the keyed connector.

Step 4 If present, connect the GND cable clamp to the metal cabinet.

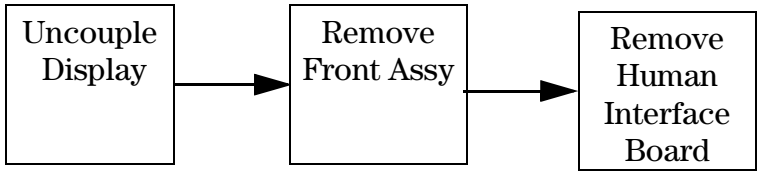
Step 5 Lower the Front Assembly onto the screen, making sure to align the hole in the Front Assembly with the plastic stud of the power switch. Push firmly so the plastic lugs snap on to the display module.

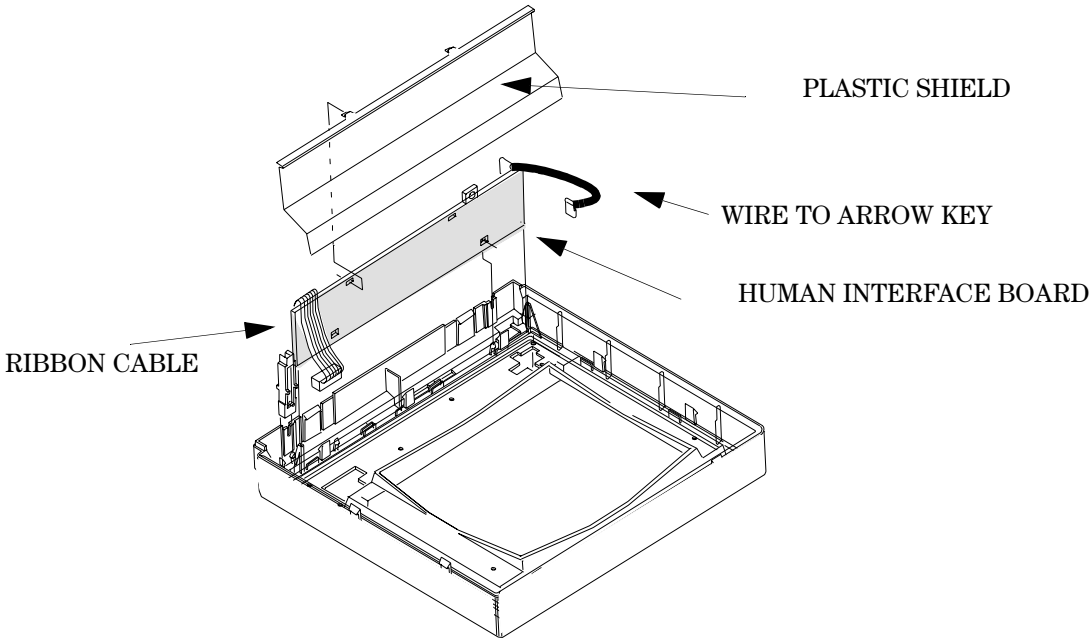
Step 6 Using the cross-tipped screwdriver, tighten the two securing screws on the bottom edge of the Front Assembly.

Step 7 Lower the front of the display so that it stands upright.

Human Interface Board

To remove the Human Interface Board





Step 1 Remove the plastic shield by pushing the two plastic tabs through the retaining holes on the Human Interface Board.

Step 2 Lay the Front Assembly face-down so you have the Human Interface Board toward you.

Step 3 Remove the ribbon connector from the Membrane Switch.

Step 4 Lean over to view the other side of the board and find the two square holes in the board that accept the plastic securing lugs.

Step 5 Using a flat-tipped screwdriver, lightly spring each lug in turn while gently pulling the top edge of the board.

Step 6 Disconnect the wire from the ARROW key.

Step 7 When both lugs are free, lift the board vertically out of the Front Assembly.

To replace the Human Interface Board

Step 1 Locate the lower edge of the interface board into the slots on either side of the Front Assembly.

Step 2 Align the LED with the hole in the Front Assembly, as you place the board into the slots.

Step 3 Push the board firmly so that the two plastic lugs engage.

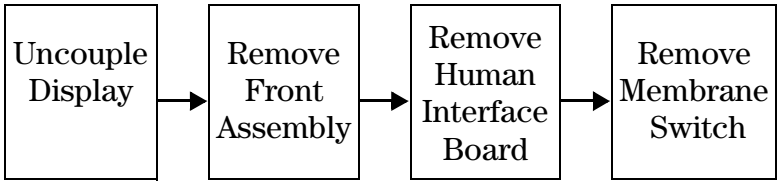
Step 4 Reconnect the ribbon connector into the Membrane Switch.

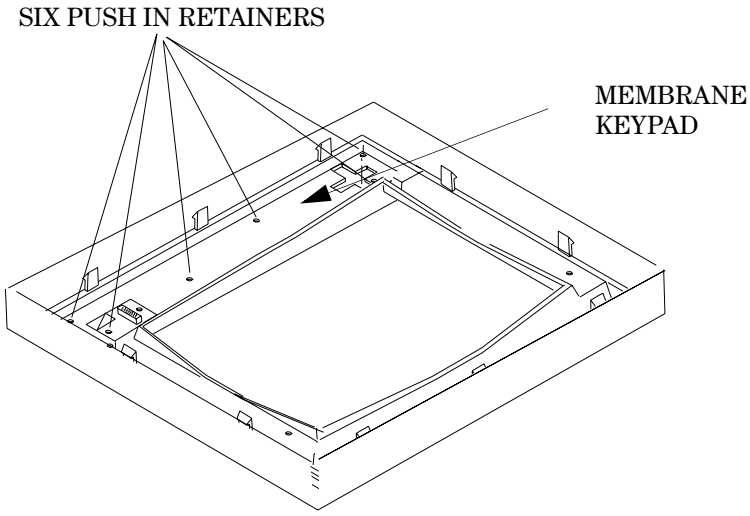
Step 5 Reconnect the wire to the ARROW key.

Step 6 Align the plastic tabs of the plastic shield with the retaining holes on the Human Interface Board and push the plastic shield until it snaps into place.

Membrane Switch

To remove the Membrane Switch





Step 1 Remove the ribbon cable from the keypad.

Step 2 Lay the Front Assembly flat on a table with the back of the Front Assembly uppermost.

Step 3 Using the screwdriver, remove the six push-in retainers.

Step 4 While pushing on the central threaded post, lift the Front Assembly clear of the keypad.

To replace the Membrane Switch

Step 1 Lay the keypad on a table with the threaded post facing up.

Step 2 Lower the Front Assembly so that the threaded posts pass through the holes in the Front Assembly.

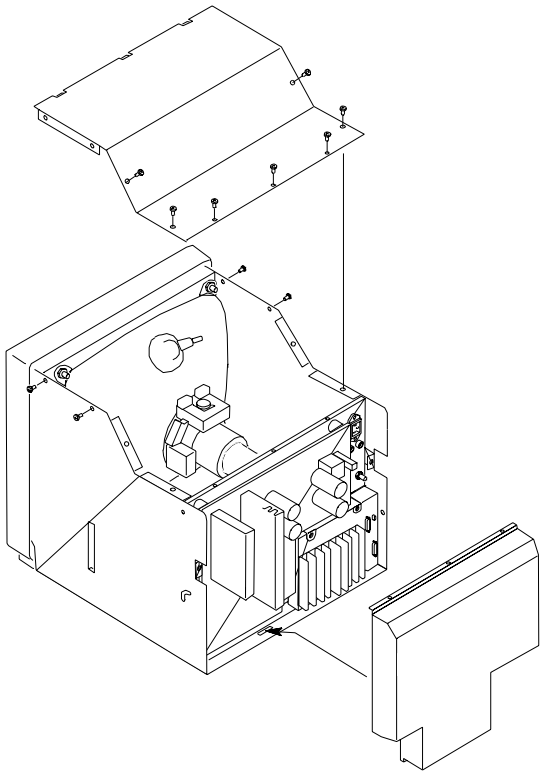
Step 3 Replace the six push-in retainers. These secure the keypad to the Front Assembly.

Step 4 Connect the ribbon cable to the keypad.

Top Metal Cover and SMPS Cover

The Top Metal Cover and the SMPS Cover are not field replaceable assemblies. Their removal and replacement are included here because they must be removed to remove other assemblies internal to the display.

To remove the Metal Cover



Step 1 Using a cross-tipped screwdriver, remove the 11 screws securing the metal cover and the SMPS cover to the display.

Step 2 Remove the Top Metal and SMPS covers from the display.

To replace the Top Metal Cover and the SMPS Cover

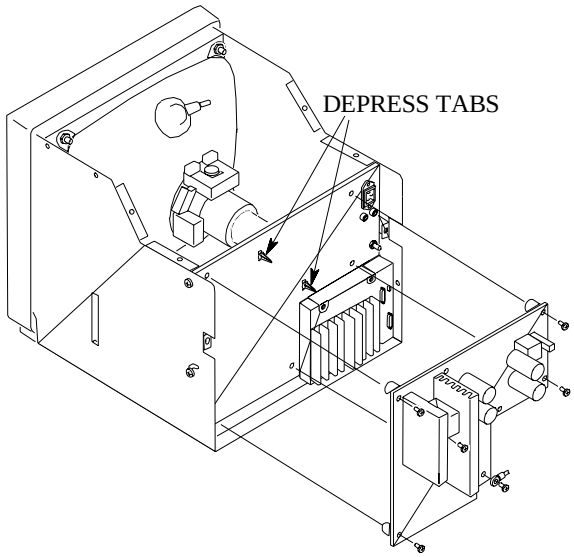
Step 1 Insert the SMPS cover over the rear of the display. Slide the bottom and sides into place and align the 2 screw holes on the cover's top edge with holes in the top frame of display.

Step 2 Insert the three tabs on the top metal cover into slots on top of the display, and align the cover's screw holes with holes in the display frame and bottom cover.

Step 3 Secure the Top Metal Cover and SMPS cover to the display using 11 screws.

Switch-Mode Power Supply

To remove Switch-Mode Power Supply (SMPS)



Step 1 Disconnect the line switch assembly on the lower right of the SMPS by pressing its top and removing its bottom tab from the connector slot. Push the assembly and cable through the hole in the SMPS.

Step 2 Disconnect the remaining four cables entering the rear of the SMPS.

Step 3 Remove the six screws securing the SMPS to the rear of the display.

Step 4 Remove the ground wire from the bottom front of the SMPS by removing one screw.

Step 5 Using a flat-bladed screwdriver, press the two white tabs (top center and right center), tilt the SMPS forward, and remove the SMPS.

To Replace the SMPS

Step 1 Place the SMPS tab holes over the two white tabs and snap into place.

Step 2 Secure the ground wire to the bottom front of the SMPS using one screw.

Step 3 Align the screw holes and secure the SMPS to the rear of the display using six screws.

Step 4 Connect the four cables to the rear of the SMPS.

Step 5 Connect the line switch assembly to the SMPS.

WARNING **When you remove or replace a power supply, you MUST perform the required safety test(s) before the equipment is used again for monitoring. See Chapter 2 for details of the safety tests.**

M1095A Backlight Removal and Replacement Procedures

NOTE It is recommended that the fluorescent tube ("backlight") in the display module be replaced after a certain time, which depends on the type of display (see Table below) If an unacceptable decrease in backlight intensity is noted the fluorescent tube has to be replaced as well.

Table 5-5 M1095A Flatscreen Display Backlight Lifetimes

M1095A s/n prefix	LCD Type (inside)	Backlight p/n	Lifetime (months)
< 3805G	AC33-10	2090-0546	**14**
3805G	AC33-24	2090-0360	**34**
3923G	AC33-29	2090-0381	**64**

CAUTION **If dirt or dust gets on the fluorescent lamp in the lamp holder during replacement, brightness variations might occur. Therefore, we recommend the use of a clean room or clean bench (at the class C level).**
In addition, the LCD module can be destroyed by static electricity. Therefore, we recommend the use of an ionizer (ion shower).

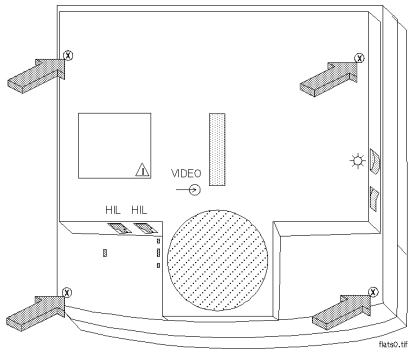
NOTE There are two different backlight replacement procedures depending on what type of M1095A Display you have.
The first procedure applies for the Old-Color type display and starts from page 5-35.
The second procedure for the New-Color type display starts from page 5-38.

Backlight replacement procedure for M1095A Old-Color Version

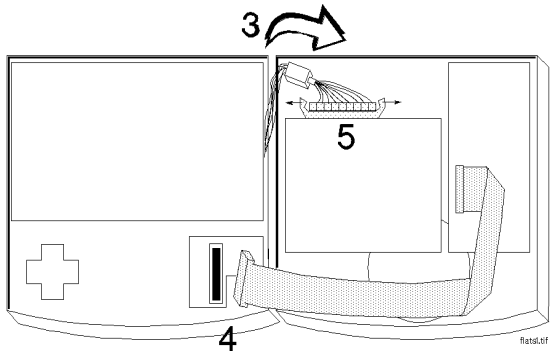
To remove rear housing

Step 1 Separate display from mounting hardware and place the display face down on the bench.

Step 2 Remove the four screws holding the rear housing in place using a number 1 Pozidrive screwdriver.



Step 3 Lift the left-hand side of the rear housing and open carefully, pivoting on the right-hand side (where the On/Off switch is).

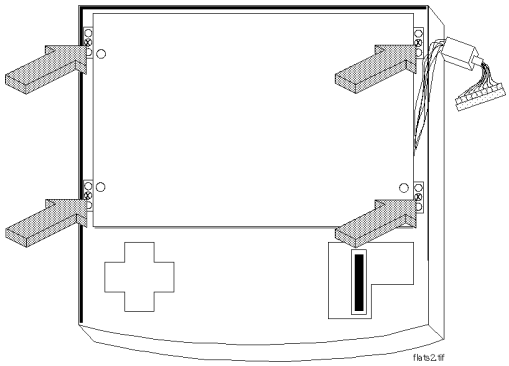


Step 4 Before placing the rear housing on the bench, remove the ribbon cable connector (gray) from the socket (black) on the board in the bottom of the front assembly.

Step 5 Disconnect the remaining connector from the rear housing, pushing the clips to the side to release the connector.

To remove screen assembly from front housing

Step 1 Using a number 1 Pozidrive screwdriver, remove the four screws holding the metal plate.



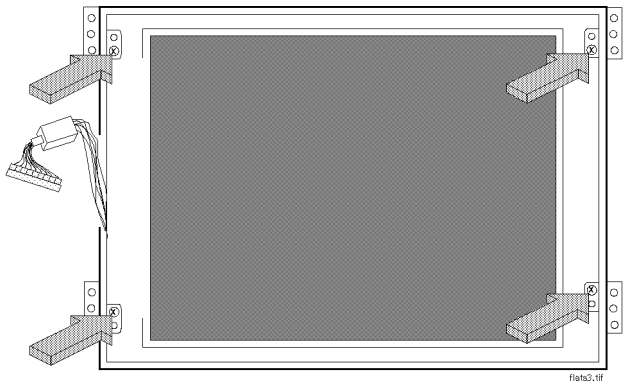
Step 2 Holding the metal plate in place, lift the entire assembly and place it face up on the bench.

NOTE For all further steps, wear gloves to avoid skin contact with the screen surface.

Step 3 Lift the front housing off the screen assembly.

CAUTION **Do not touch the screen surface.**

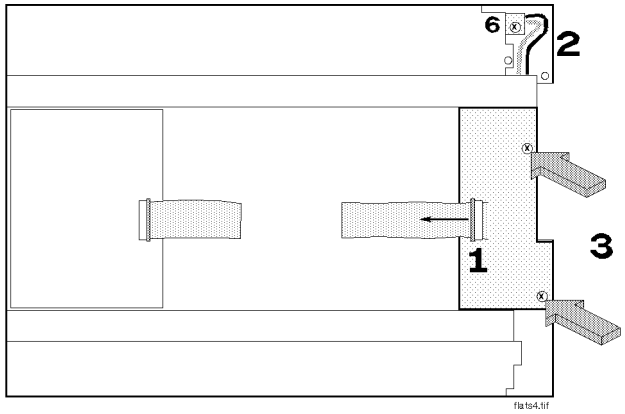
Step 4 Using a Pozidrive number 1 screwdriver, remove the four large screws holding the screen onto the metal plate.



Step 5 Lift the screen assembly off the metal plate and lay it face down on the clean bench.

To remove backlight assembly

Step 1 Pull out cable holder to release flat cable and disconnect.



Step 2 Using round-tipped tweezers, release the lamp cables from the cable channel.

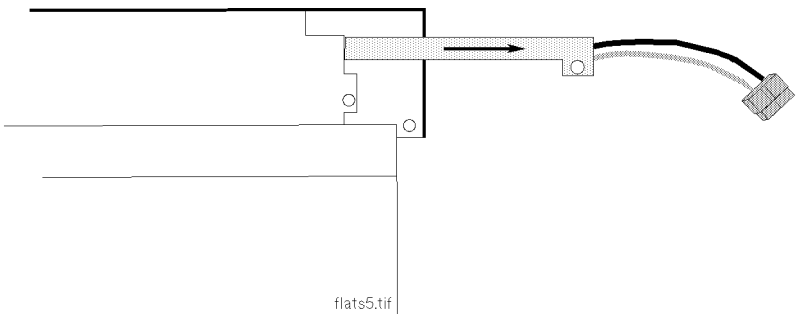
Step 3 Using a small cross-tipped screwdriver, remove the two screws holding the inverter board.

Step 4 Slip the inverter board out from beneath the two plastic retaining tabs.

Step 5 Unplug lamp cables from inverter board.

Step 6 Using a small cross-tipped screwdriver, remove retaining screw on backlight.

Step 7 Using the lamp cables, pull gently and in a straight line on the backlight assembly to remove it.

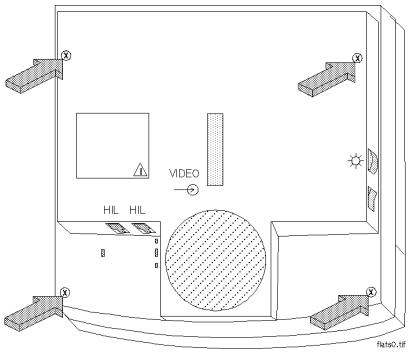


Backlight replacement procedure for M1095A New-Color Version

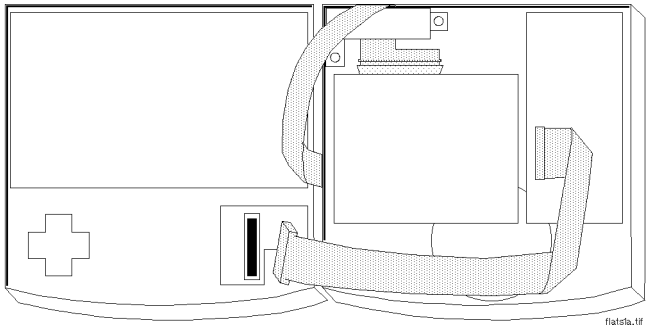
To remove rear housing

Step 1 Separate display from mounting hardware and place the display face down on the bench.

Step 2 Remove the four screws holding the rear housing in place using a number 1 Pozidrive screwdriver.



Step 3 Lift the left-hand side of the rear housing and open carefully, pivoting on the right-hand side (where the On/Off switch is).



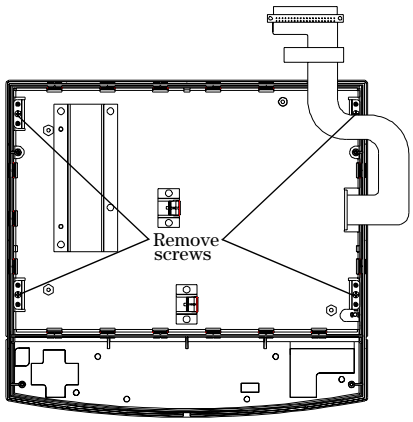
Step 4 Before placing the rear housing on the bench, remove the ribbon cable connector (gray) from the socket (black) on the board in the bottom of the front assembly.

Step 5 Remove the two crosshead screws securing the ferrite bead clamp and lift it clear of the video cable.

Step 6 Disconnect the video cable from the connector on the video board.

To remove LCD panel from front housing

Step 1 Using a number 1 Pozidrive screwdriver, remove the four screws holding the metal plate.



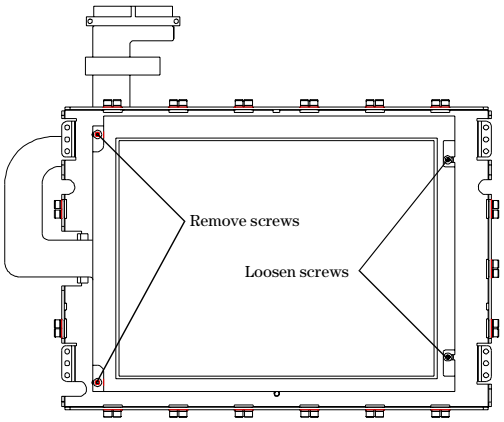
Step 2 Holding the metal plate in place, lift the entire assembly and place it face up on the bench.

NOTE For all further steps, wear gloves to avoid skin contact with the screen surface.

Step 3 Lift the front housing off the screen assembly.

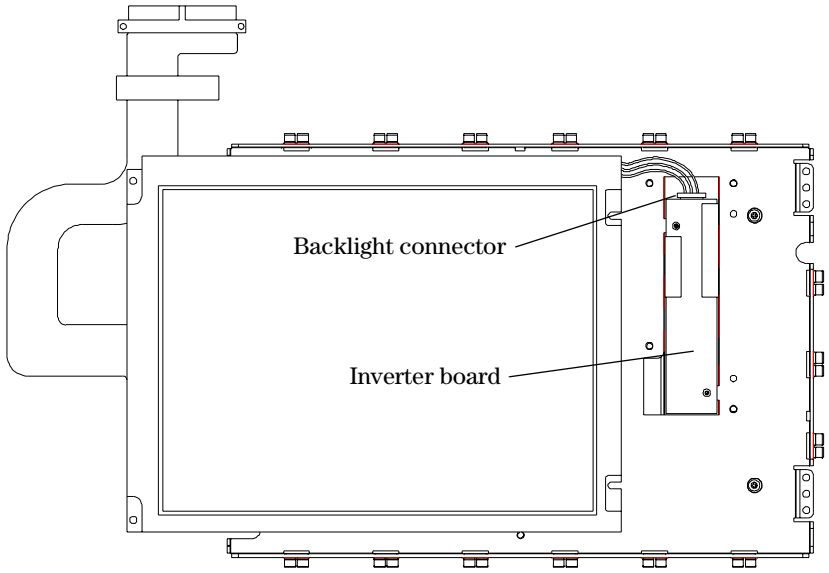
CAUTION **Do not touch the screen surface.**

Step 4 Using a Pozidrive number 1 screwdriver, remove the two right-hand screws and loosen the two left-hand screws that hold the screen onto the metal plate.



To remove backlight assembly

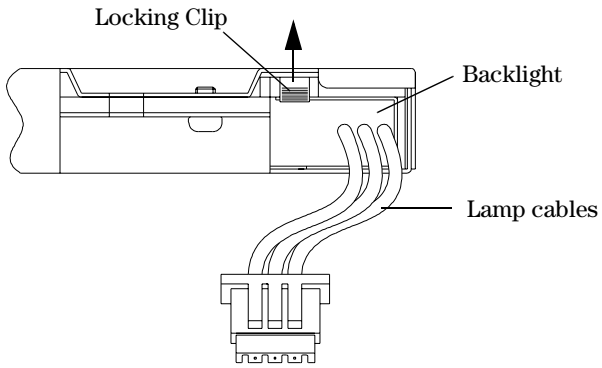
Step 1 Move the LCD panel 5cm to the left to expose the inverter board.



Step 2 Unplug backlight connector from inverter board.

Step 3 Look on the edge of the LCD panel and raise the locking clip to release the backlight.

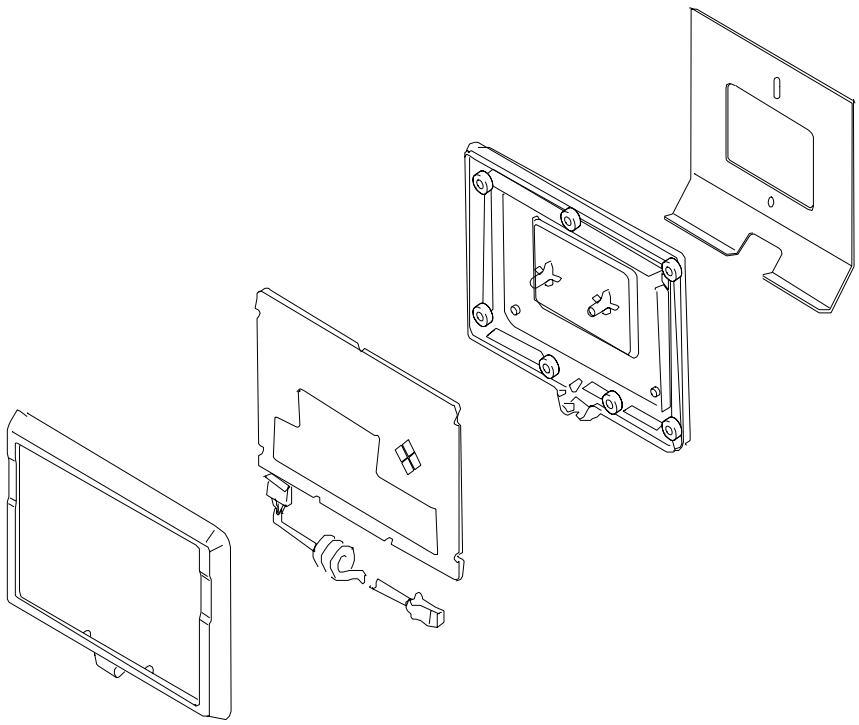
Step 4 Using the lamp cables, pull the backlight gently and in a straight line out of the LCD panel.



Handheld Keypad

The following is a list of replaceable parts for the handheld keypad.

Replaceable Part
Housing Assembly (includes top cover, bottom cover, magnet, rubber feet, and screws)
Board Assembly (includes switch board and logic board assembly)
Cable Assembly



Housing Assembly

To Remove the Housing Assembly

Step 1 Place the handheld keypad face down on a table.

Step 2 Using a cross-tipped screwdriver, remove the 7 screws from the bottom cover.

Step 3 Remove the keypad bottom cover.

Step 4 To remove the rubber feet, push the feet through the holes in the bottom cover from the inside.

Step 5 Lift the printed circuit boards out of the housing assembly to expose the top cover.

To Replace the Housing Assembly

Step 1 If the rubber feet have been removed, replace them by pushing the stubs through the holes in the bottom cover from the outside.

Step 2 Place the bottom cover on a table with the magnet side down.

Step 3 Place the printed circuit boards (with the keys facing up) in the bottom cover, such that the standoffs on the bottom cover fit through the holes in the logic board.

Step 4 Dress the cable through the strain relief and out through the bottom cover.

Step 5 Replace the top cover and turn the keypad over.

Step 6 Using a cross-tipped screwdriver, replace the 7 screws.

Step 7 If you are replacing the housing assembly with a new one, peel the serial number off of the old housing assembly and affix it to the new one.

External Alarm Device

The following is a list of replaceable parts for the External Alarm Device.

Replaceable Part
Front Cover (including light diffusers and light pipe)
Handheld Keypad Bracket
HIF Board (including ribbon cable)
LED Carrier Board
Loudspeaker
Protection Flap for HIL Connectors
Remote On/Off Cable

To Disassemble the External Alarm Device

Step 1 Remove the four long screws at the back of the device.

Step 2 Remove the front and rear covers.

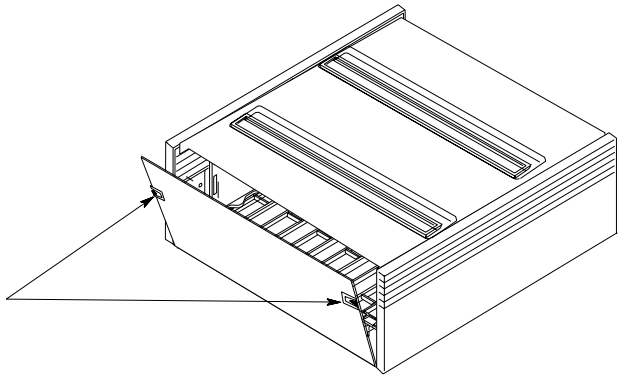
Step 3 Remove internal components by removing the short screws as appropriate.

Computer Module Removal and Replacement

The following is a list of replaceable parts for the Computer Module. These descriptions apply equally to the M1046A Computer Module and the new M1046B Computer Module. Where a procedure or certain steps within a procedure apply to only either the M1046A or M1046B it will be labeled as either M1046A only or M1046B only.

Replaceable Part	Page
Rear Cover	5-45
DC/DC Converter	5-46
Integral Rack - M1046A only	5-47
Front Plastic Cover - M1046B only	5-48
Integral Power Supply - M1046B only	5-49
Sheet Metal Cover - M1046B only	5-51
Front Function Card	5-51
Rear Function Cards	5-54
Side Cover	5-56
Top Cover	5-57
Backplane Board Assy	5-58
Plastic Feet	5-59
Locking CAM	5-60

Rear Cover



The rear cover is removed to gain access to the rear connectors and function boards.

To Remove the Rear Cover

Step 1 Slide the two spring locks toward the center of the cover and lift the cover clear of the computer module.

To replace the Rear Cover

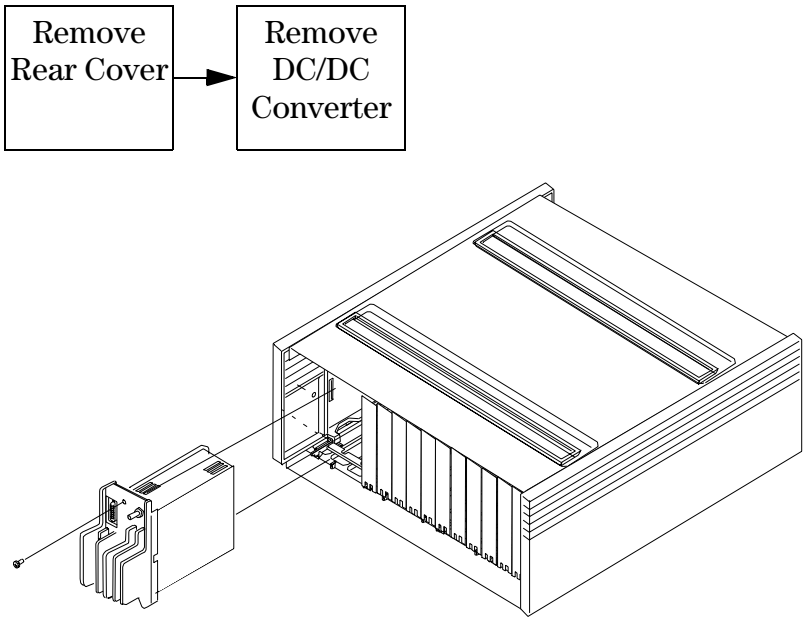
Step 1 Locate the bottom edge of the cover in the back of the computer module.

Step 2 Push the cover toward the computer module until the two spring locks click to lock the cover into place.

DC/DC Converter

The DC/DC Converter is secured to the top cover of the outer casing and must be removed to gain access to the centre plane of the computer module.

The work-flow for removing the DC/DC converter is as follows:



To Remove the DC/DC Converter

Step 1 Remove the power input cable (60 V) from the rear of the DC/DC converter.

Step 2 Using a cross-tipped screwdriver, remove the screw that secures the top edge of the DC/DC converter to the computer module.

Step 3 Grip the metal heat sink of the DC/DC converter and slide it out horizontally until it is completely clear of the computer module.

To Replace the DC/DC Converter

Step 1 Locate the card-edge of the DC/DC converter into the far left slot in the rear of the computer module.

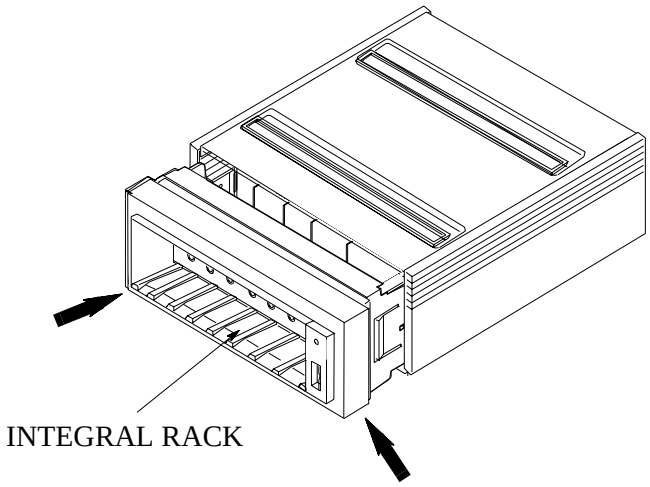
Step 2 Slide the DC/DC converter into the computer module until it locates into the connector on the centre board and firmly seat it into the connector.

Step 3 Replace the screw on the top edge of the DC/DC converter and tighten using a cross-tipped screwdriver.

NOTE When you replace the DC/DC converter on a M1046B, the shorting stub from the old one MUST be replaced in the connector or the system will not function correctly.

Integral Rack - M1046A only

The integral rack holds the plug-in modules. It must be removed to gain access to the CPC Flash connector and the other front function cards.



To Remove the Integral Rack

Step 1 Stand in front of the computer module with the integral rack facing you.

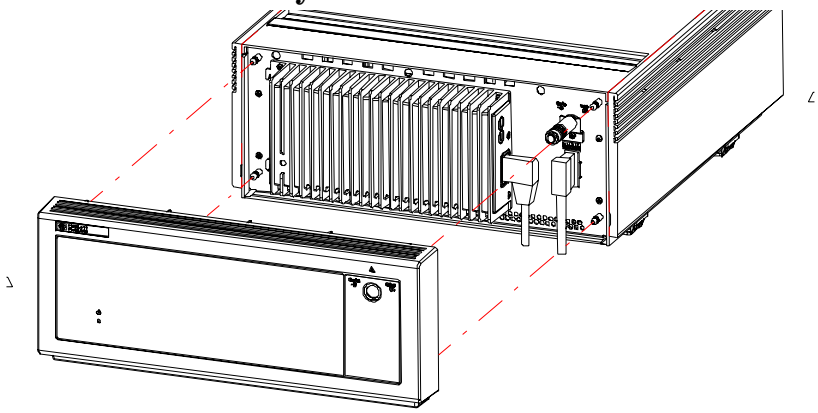
Step 2 Press the tabs on the lower side edge of the integral rack and slide the rack gently towards you until it clears the computer module.

To Replace the Integral Rack

Step 1 Locate the two large tabs inside the cavity of the computer module.

Step 2 Gently slide the integral rack into the computer module until the securing tabs on either side of the computer module engage. Check that the rack is secure.

Front Plastic Cover - M1046B only



To Remove the Plastic Front Cover

Step 1 Stand in front of the computer module with the integral rack facing you.

Step 2 Grip the Plastic Cover firmly on each side and pull directly towards you.

To Replace the Plastic Front Cover

Step 1 Align the four posts on the inside of the plastic cover with those on the computer module.

Step 2 Firmly push the plastic cover, on each side, so that the cover posts fit over the computer module posts.

Power Fuses

The power fuses provide over-voltage protection to the input line voltage circuitry. They are generally removed for inspection. If the fuses are bad (blown), they can only be replaced by the same type of fuse with an identical rating. Table 6-3 shows the fuse ratings.

To Remove the Power Fuses

The plastic front cover needs to be removed to remove the Power Fuses.

Step 1 Using a flat-bladed screwdriver, turn the fuse cap a quarter turn counter-clockwise. The fuse cap should spring slightly from the rear of the display.

Step 2 Pull the fuse cap and fuse clear of the display.

Step 3 Pull the fuse out of the fuse cap and inspect it for a blown condition. If you are unsure, use an ohmmeter to measure the resistance of the fuse. If the fuse reads anything other than a short, the fuse is bad and needs to be replaced.

Step 4 Repeat steps 1 through 3 for the other fuse.

Table 5-6 Fuse Ratings for the M1046B

Display	Fuse	Part Number
M1046B	T3.15H, 250V	2110-1025

To replace the Power Fuses

Only use a fuse of the correct rating.

Step 1 Place one end of the fuse, of the correct value, into the fuse cap.

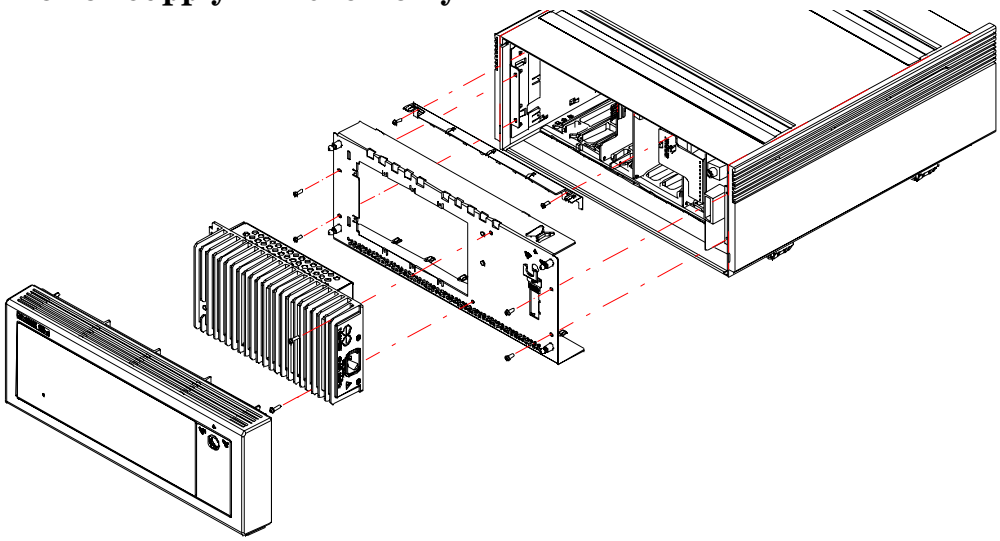
Step 2 Place the fuse and fuse cap into the receptacle in the rear of the display.

Step 3 Using a flat-tipped screwdriver, gently push the fuse cap into the display.

Step 4 Hold the fuse cap into the display and turn the fuse cap a quarter-turn clockwise.

Step 5 Repeat for the other fuse.

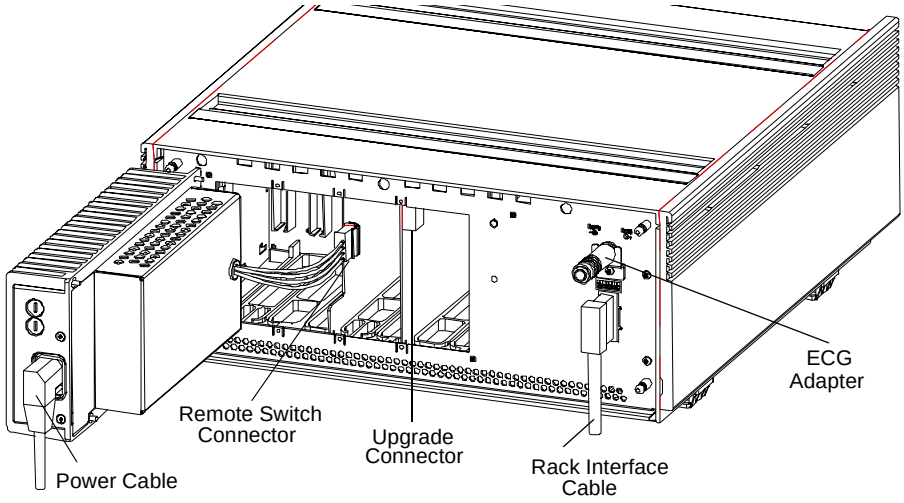
Integral Power Supply - M1046B only



To Remove the Integral Power Supply

Step 1 Use a cross-tipped screwdriver to undo the two captive screws that secure the power supply to the computer module, slide the power supply to the right and remove from the sheet metal cover.

The integral power supply has two hooks on the left of its casing allowing it to be operated in the Service Mode position for software upgrades.



Step 2 Unplug the cable-end connector from the REMOTE_SWITCH function card.

To Replace the Integral Power Supply

Step 1 Place the power supply close to the aperture in the metal cover.

Step 2 Connect the cable-end connector to the REMOTE_SWITCH function card.

Step 3 Locate the power supply into position in the aperture on the sheet metal cover of the computer module and slide the power supply to the left. Tighten the two captive screws to secure the power supply to the computer module.

WARNING

When you fit a new integral power supply, you MUST perform the required safety test(s) on the M1046B Computer Module before it is used again for monitoring.

When you move the integral power supply (for example, for an upgrade or to clone settings), you MUST perform the required safety test(s) on the M1046B Computer Module before it is used again for monitoring.

See Chapter 2 for details of the safety tests.

Sheet Metal Cover - M1046B only

To Remove the Sheet Metal Cover

Step 1 Remove Plastic Cover, power cord, integral power supply and unplug the Satellite Rack cable and the ECG Adapter.

Step 2 Use a cross-tipped screwdriver to remove the 4 screws that secure the cover to the computer module and remove the cover.

To Replace the Sheet Metal Cover

Step 1 Locate the cover into position in the front of the computer module. Replace and tighten the 4 screws to secure the sheet metal cover to the computer module.

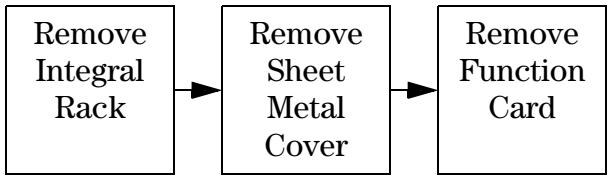
Step 2 Replace the integral power supply and plug in the power cord, Satellite Rack cable and the ECG Adapter. Replace the Plastic Cover.

WARNING **When you replace/refit the integral power supply in the M1046B Computer Module, a safety test MUST be performed on the Computer Module before it is used again for monitoring. See Chapter 2 for details of the safety tests.**

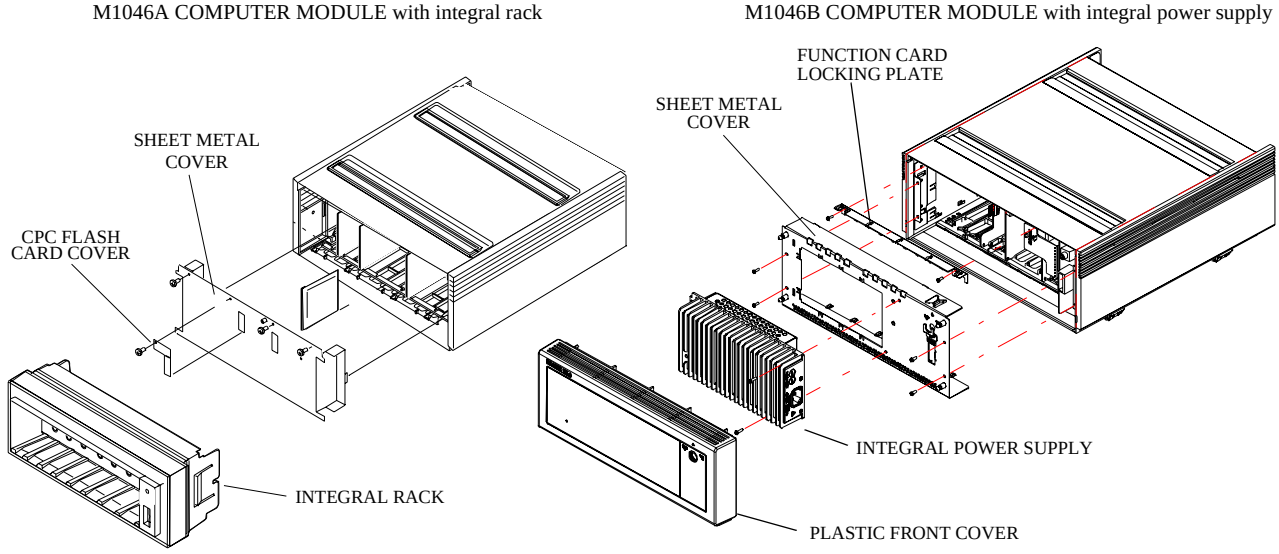
Front Function Card

The front function cards are in even slots 2-24. An individual face plate or one sheet metal cover will cover the function cards.

The work-flow diagram for removing function cards is as follows. The function card can be removed using a board extractor tool (M1046-44901).

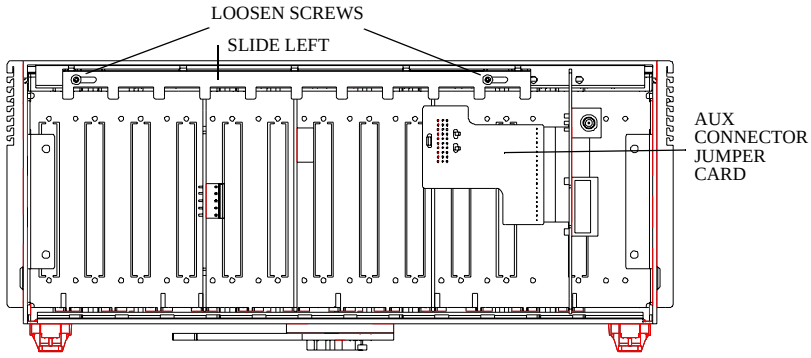


To **Remove a Front Function Card**



Step 1 If the computer module has a sheet metal cover over the function cards, use a cross-tipped screwdriver to remove the 4 screws that secure the cover to the computer module and remove the cover.

Step 2 **For M1046B only**
Loosen the two screws for the metal function card lock and slide it to the left to allow cards to be removed.
If you are removing a function card in front slots 18, 20, 22, or 24, remove the AUX_CONNECTOR card's jumper card from the RACK_IF connector.



Step 3 Using the board extractor tool attached to the rear of the computer module, firmly grip the card and slide it out horizontally until the card is completely clear of the computer module.

To Replace a Front Function Card

Step 1 Locate the card-edge into the appropriate slot in the computer module.

Step 2 Slide the card into the computer module until it locates into the connector center plane, then seat the card firmly into the connector.

Step 3 **For M1046B only**
Slide the metal function card lock to the right so the function cards cannot be removed and tighten the two screws.
Replace the AUX_CONNECTOR card's jumper card to the RACK_IF connector.

Step 4 If the computer module has a sheet metal cover, locate the cover into position in the front of the computer module. Ensure that the CPC Flash port in slot 12 is accessible through the access window in the cover. Replace and tighten the 4 screws to secure the cover to the computer module.

Step 5 **For M1046B only**
Replace the ECG_sync adapter so that you can connect to it through the Plastic Cover.

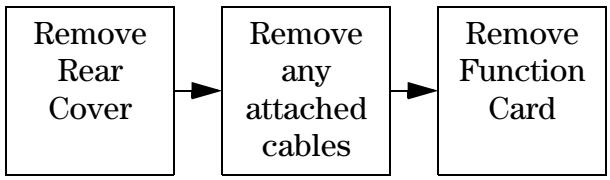
Step 6 If the function card has a face plate, use a cross-tipped screwdriver to tighten the captive screw on the top of the face plate to secure the card to the computer module.

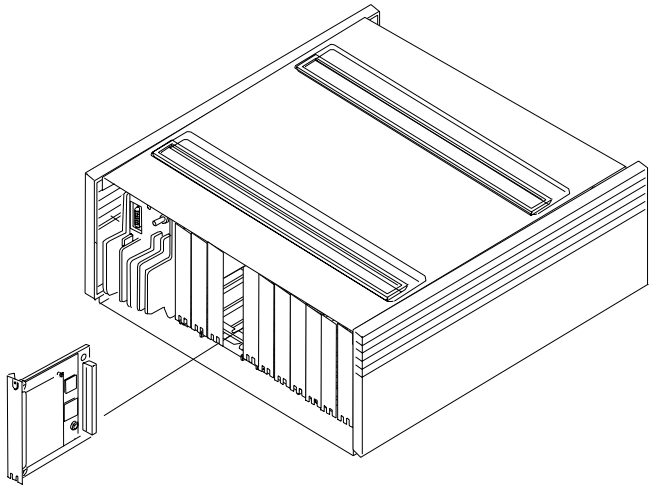
WARNING **When you replace/refit the integral power supply in the M1046B Computer Module, a safety test MUST be performed on the Computer Module before it is used again for monitoring. See Chapter 2 for details of the safety tests.**

Rear Function Cards

Rear function cards are in odd slots 1-21.

The work-flow diagram for removing function cards is as follows. The function card can be removed using a board extractor tool (M1046-44901).





To Remove a Rear Function Card

Step 1 Using a flat-tipped screwdriver, remove any cables connected to the rear edge of the card.

Step 2 Using a cross-tipped screwdriver, back-out the captive screw on the top of the face plate that secures the card to the computer module.

Step 3 Using the board extractor tool attached to the rear of the computer module, firmly grip the metal plate at the rear of the card and slide it out horizontally until it completely clears the computer module.

To Replace a Function Card with a Face Plate

Step 1 **For M1046B only**
If you are replacing any DSPC controller card with the Asian/Eastern Europe language option fitted, then you need to set the DIP switches on the function card to select the correct language.

Step 2 Locate the card-edge into the appropriate slot in the computer module.

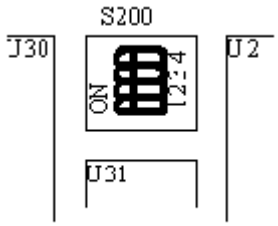
Step 3 Slide the card into the computer module until it locates into the connector on the backplane, then seat the card firmly into the center plane.

Step 4 Using a cross-tipped screwdriver, tighten the captive screw on the top of the card to secure the card to the computer module.

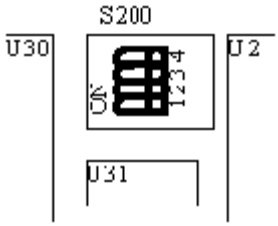
Configuring the Display Controller Card

For each type of display there are two types of display controller card: Roman alphabet-based and other languages. For part numbers see the Parts List chapter. The non-Roman-based controller card contains a Font ROM with four switches for selecting the language.

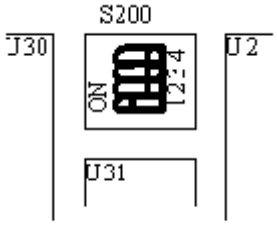
If you are replacing the display controller card with an Eastern Europe or Asian language option fitted, then you need to ensure that the DIP switches are set to the correct language. See the following figure and table for the language settings.



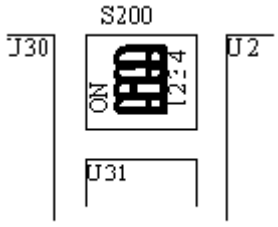
Factory Default



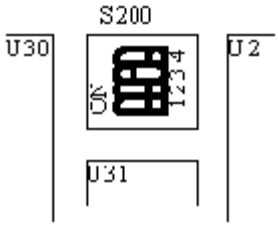
Japanese



Chinese (PRC)



Taiwanese (ROC)



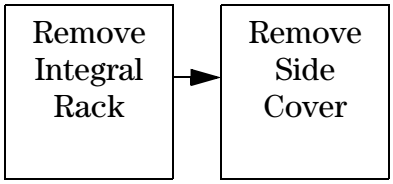
EUR-EAST (Pol, Rus, Gre, Tur)

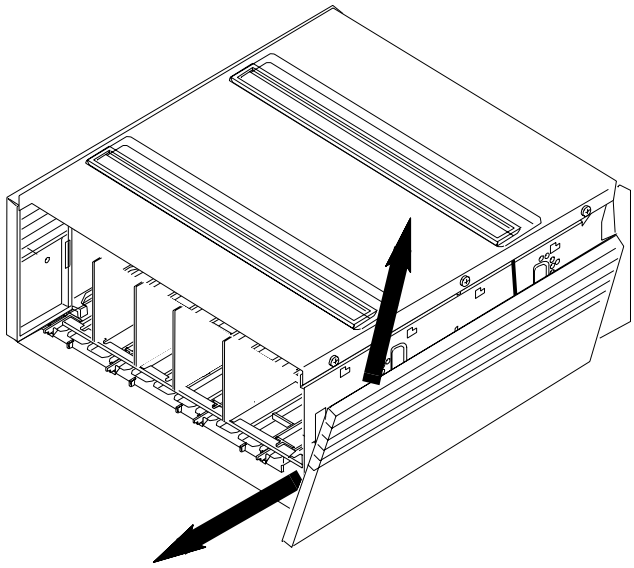
Language	DIP-Switch Settings			
	1	2	3	4
Factory Default (Font ROM disabled)	closed	closed	closed	closed
Japanese	open	open	open	open
Chinese (PRC)	closed	open	open	open
Taiwanese (ROC)	open	closed	open	open
EUR-EAST (Polish, Russian, Greek, Turkish)	open	open	closed	open

Side Cover

The side covers must be removed to gain access to the screws attaching the top cover to the computer modules.

The work-flow diagram for the removal of the side cover is as follows.





To Remove the Side Covers

Step 1 Grip the side cover and slide it horizontally towards the front of the computer module.

Step 2 Lift the cover so the tabs on the bottom of the cover slide out of the slots and clear of the computer module.

To Replace the Side Covers

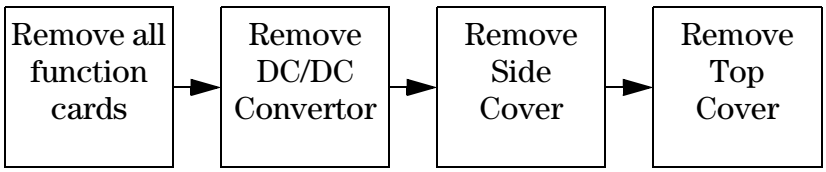
Step 1 Locate the tabs on the bottom of the side cover into the slots on the side of the computer module and align it vertically to the computer module.

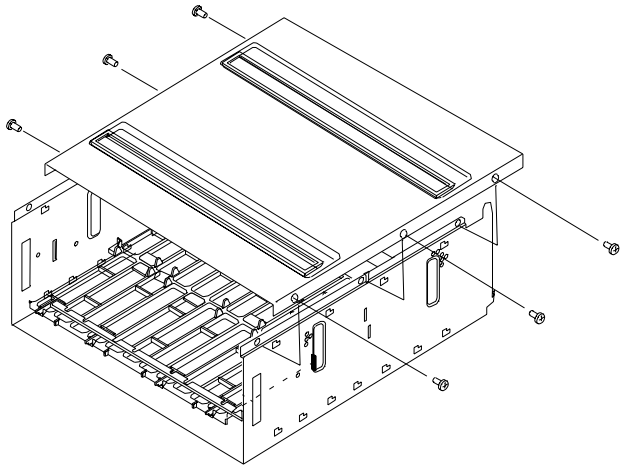
Step 2 Slide the cover horizontally toward the back of the computer module so that the tabs lock the side cover in place.

Top Cover

The top cover must be removed to gain access to the center board of the computer module.

The work flow diagram for removal of the top cover is as follows.





To Remove the Top Cover

Step 1 Using a cross-tipped screwdriver, remove the 6 screws (3 on each side) that secure the top cover to the computer module.

Step 2 Lift the top cover clear of the computer module.

To Replace the Top Cover

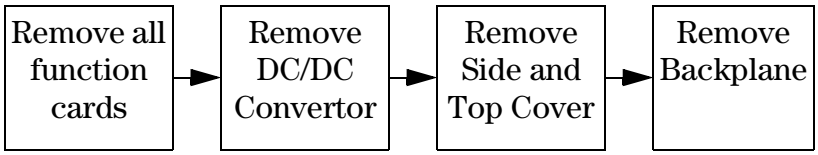
Step 1 Locate the top cover onto the computer module.

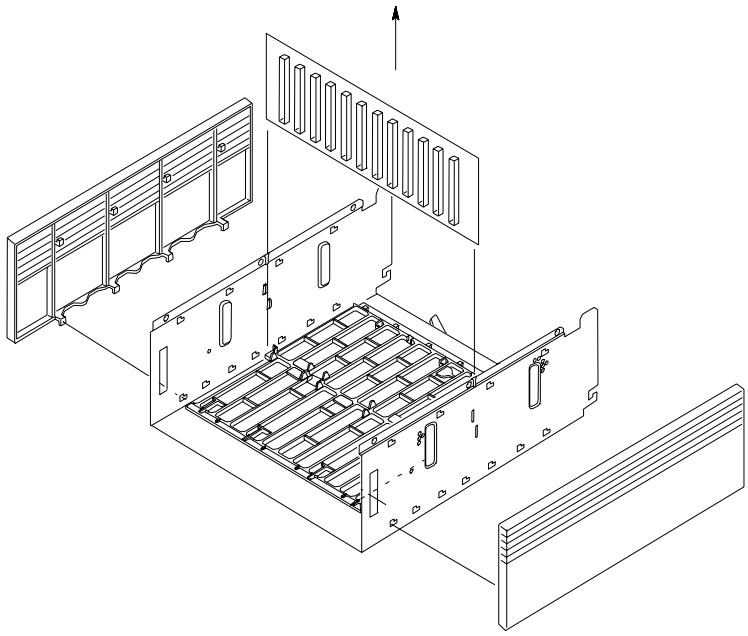
Step 2 Using the cross-tipped screwdriver, replace and tighten the 6 screws (three each side).

Backplane Board Assy

The work flow diagram for removal the backplane is as follows

The backplane holds the connectors for the front and rear function cards.





To Remove the Backplane Board Assy

Step 1 Grip the uppermost edge of the backplane and lift it directly out of the computer module.

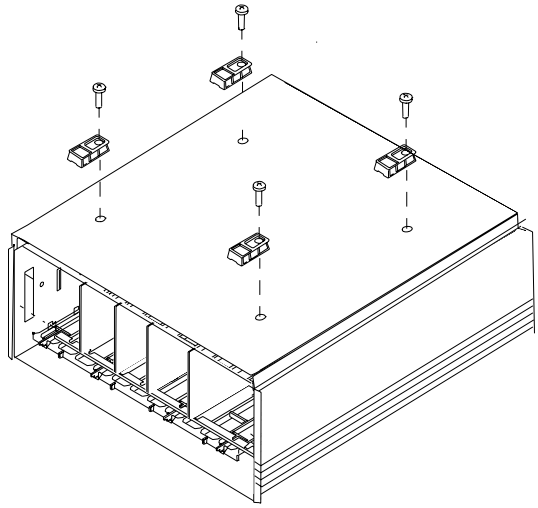
To Replace the Backplane Board Assy

Step 1 Stand to the rear of the computer module and hold the backplane by its uppermost edge with the large space between the connectors on the left.

Step 2 Locate and seat the backplane in the slot in the center of the computer module.

Plastic Feet

The plastic feet are removed for various mounting solutions.



To Remove the Plastic Feet

Step 1 Place the computer module upside-down on a suitable plain table.

Step 2 Using a cross-tipped screwdriver, remove the screw securing each of the plastic feet.

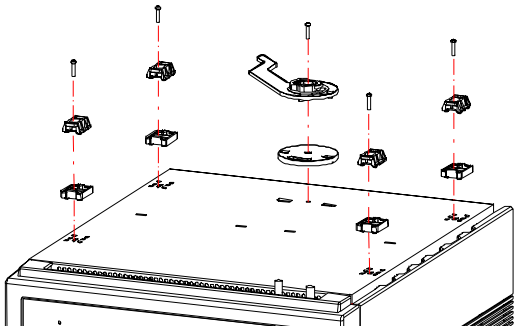
To Replace the Plastic Feet

Step 1 Locate the 4 feet over the 4 holes on the base of the computer module so that the slot it forms with the base faces the rear of the computer module.

Step 2 Replace and tighten the screws to secure the feet in place.

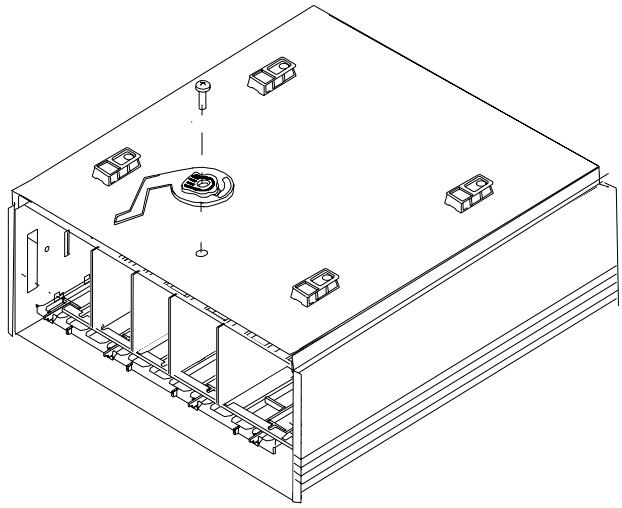
CAUTION

M1046B Computer Module only:
When you remove the plastic feet you may find there are standoffs to increase the height under the computer module. You must refit these standoffs with the plastic feet or use shorter screws to refit the feet alone.



Locking CAM

The locking cam secures the computer module to mounts.



To Remove the Locking Cam

Step 1 Place the computer module upside-down on a suitable plain table.

Step 2 Using a cross-tipped screwdriver, remove the single mounting screw securing the locking cam to the computer module.

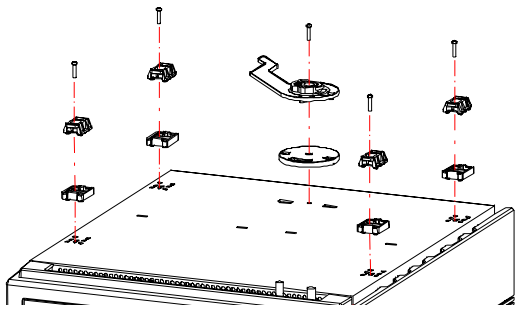
To Replace the Locking Cam

Step 1 Locate the locking cam over the hole in the base of the computer module so the locking cam points towards the rear of the unit.

Step 2 Using the cross-tipped screwdriver, replace and tighten the single mounting screw to secure the locking cam to the computer module.

CAUTION

M1046B Computer Module only:
When you remove the locking cam you may find there is a standoff to increase the height under the computer module. You must refit this standoff with the locking cam or use a shorter screw to refit the locking cam alone.



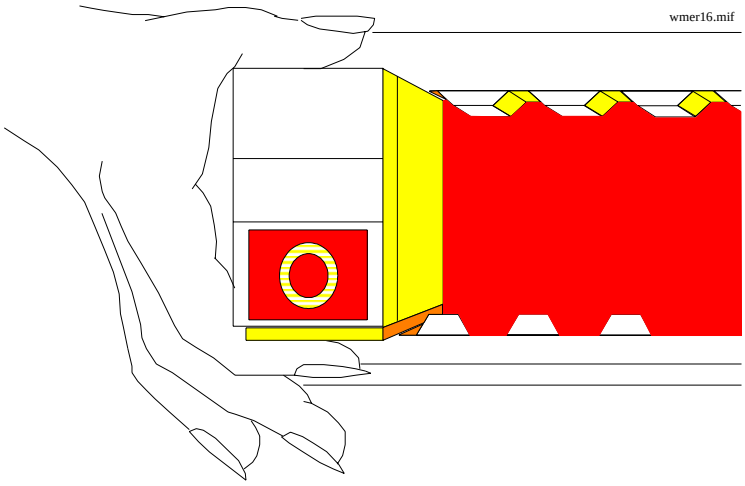
Module Rack

The following is a list of replaceable parts for the module rack.

Replaceable Part	Page
Plug-In Module	5-61
Mounting Clamp	5-62

Plug-In Module

The plug-in modules can be used in integral racks and Satellite Racks.



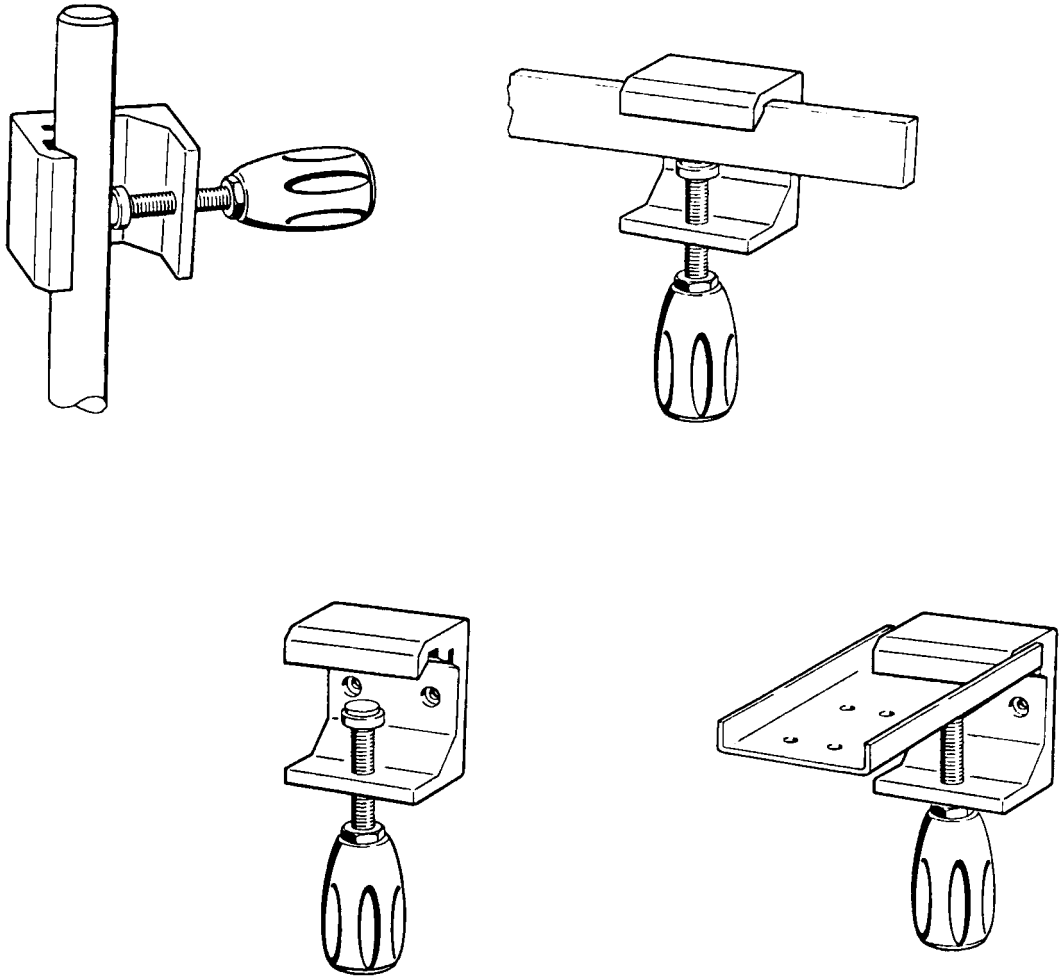
To Remove the Plug-in Module from the Rack

Step 1 Grip the plug-in module and lift the snaplock at the bottom of the module. Then pull the module directly out of the rack.

To Replace the Plug-in Module in the Rack

Step 1 Locate the plug-in module into a vacant slot in the rack. Push the plug-in module into the integral rack slot until the module locks into place.

Mounting Clamp



To Remove the Mounting Clamp

Step 1 Remove the Satellite Rack from the rail or pole by loosening the clamp.

Step 2 Using a cross-tipped screwdriver, remove the two screws securing the clamp to the rack.

To Replace the Mounting Clamp

Step 1 Align the holes in the mounting clamp with one pair of holes on the back of the Satellite Rack, depending on whether it is to be mounted on a horizontal rail or vertical pole.

Step 2 Using a cross-tipped screwdriver, replace and tighten the screws.

Step 3 Attach the mounting clamp and Satellite Rack to either the rail or the pole.

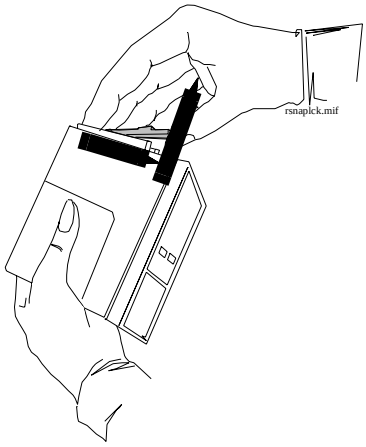
Plug-in Modules

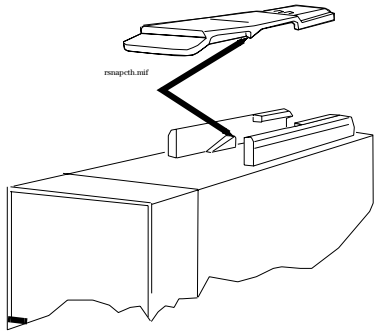
The following is a list of replaceable parts for the plug-in modules.

Replaceable Parts	Page
Snap Lock	5-64
Plug-In Module Disassembly	5-65
NBP Inlet Connector Insert	5-67
NBP Pump	5-68
tcpO2/tcpCO2 Calibration Chamber Kit	5-69
Recorder Module Paper	5-71

Snap Lock

The snap lock holds the plug-in module in the integral or Satellite Rack.





To Remove the Snap Lock

Step 1 Grip the module firmly in one hand and using your thumb, pull the front edge of the snap lock away from the plug-in module so that the lug on the snap lock clears the retaining edge of the module.

Step 2 Push on the rear edge of the snap lock to move the snap lock through the slot toward the front of the module until it is clear.

To Replace the Snap lock

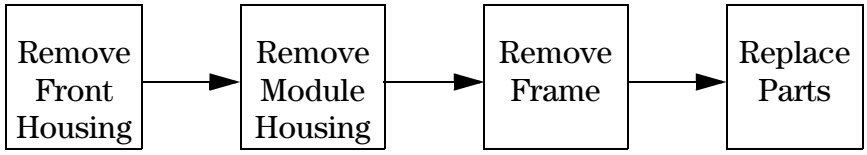
Step 1 Locate the snap lock into the slot on the bottom of the module.

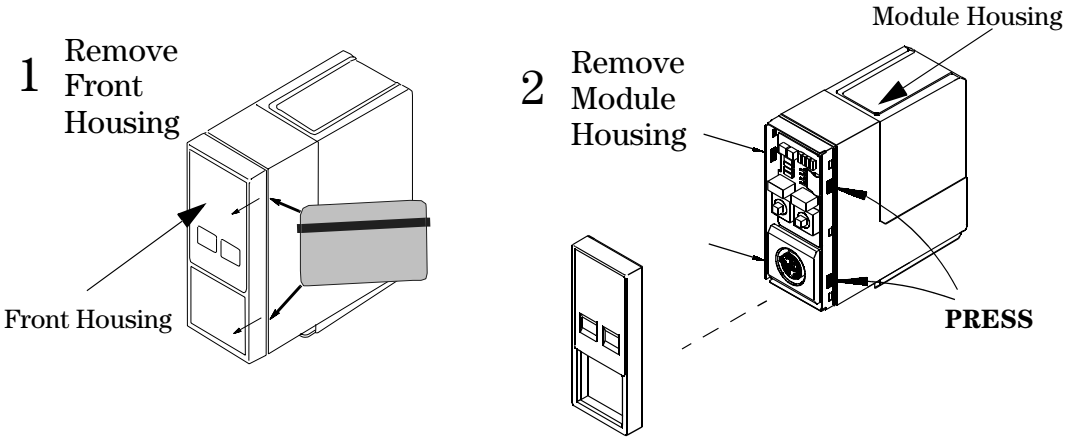
Step 2 Slide the snap lock toward the rear of the module until the lock snaps into position.

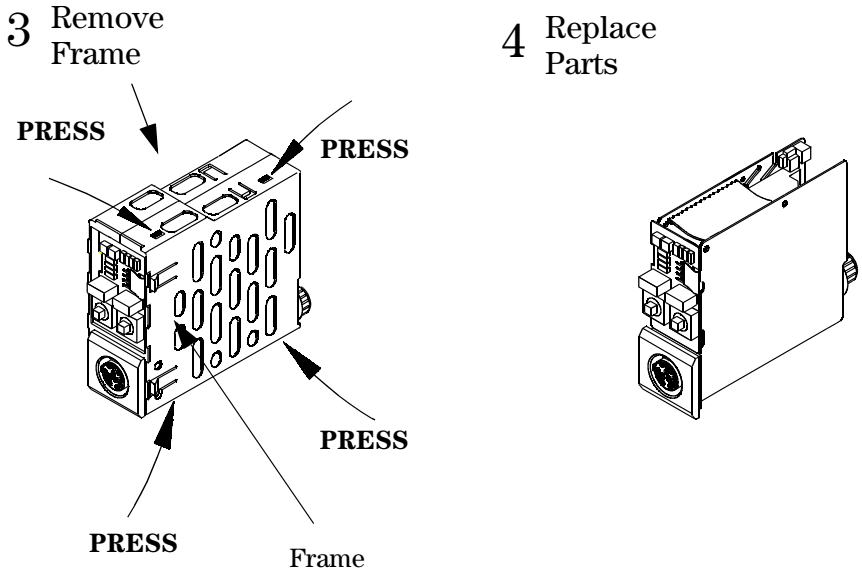
Plug-In Module Disassembly

Disassembly of the parameter module enables replacement of the front assembly, overlay, middle frame, LEDs, switches and connectors.

The work-flow for plug-in module disassembly is as follows.







WARNING **When you disassemble/assemble a plug-in module a patient leakage current test must be performed before it is used again for monitoring. See Chapter 2 for details.**

To Disassemble a Plug-In Module

Step 1 Remove the Front Housing.

- Place the module on a flat surface and insert a card (similar to a credit or cheque type card) into one side of the module to disengage the 2 tabs securing the front housing to the module housing.
- Pull the edge of the front housing away from the module housing.
- Carefully turn the module over so the free edge does not reengage and repeat the first two steps on the other side of the module. The front housing should now be free of the module housing.

Step 2 Press the 4 tabs on the front rim of the module housing and remove the module housing from the internal frame and PCB.

Step 3 Press the 2 tabs on the top and 2 tabs on the bottom of the frame and pull the frame clear of the PCB.

Step 4 Replace the appropriate connector, switches and LEDs on the module.

To Reassemble a Plug-in Module

Step 1 Seat the connectors and PCBs into position in the frame.

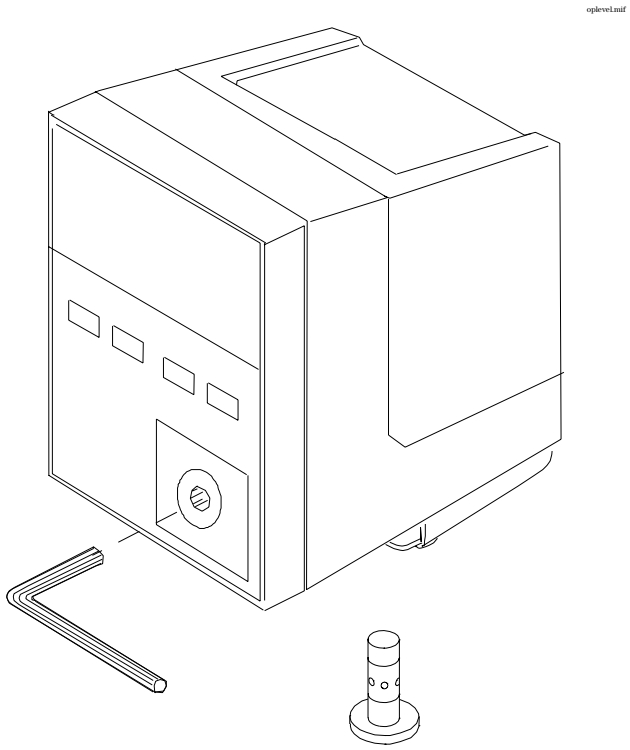
Step 2 Carefully snap-lock the frame together with the module PCB inside.

Step 3 Re-insert and snap-fit the frame into the module case so the front and rear connectors align with the module case.

Step 4 Snap-fit the front housing onto the front of the module case so the openings in the front housing match the LEDs and keys.

NBP Inlet Connector Insert

The NBP Inlet Connector is replaced without opening the module. Do not remove the transparent cover on the connector.



To Remove the NBP Inlet Connector Insert

Step 1 Use a 6-mm Allen key to unscrew the defective connector insert from the inlet of the NBP module.

Step 2 Verify that the connector insert contains 4 metal balls in the transparent cover. If a ball is missing, it may have fallen into the module tubing. Damage could result necessitating exchange of the module.

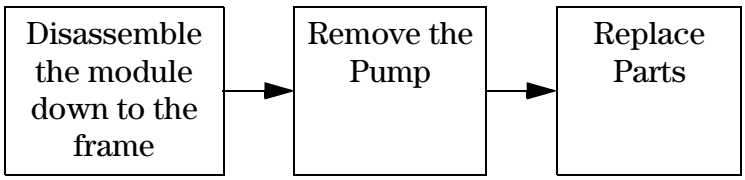
To Replace the NBP Connector Insert

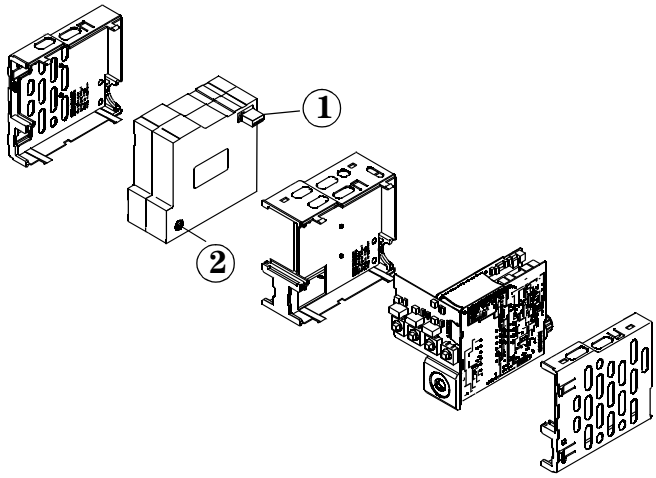
Step 1 Using a torque wrench, screw the replacement connector insert into the NBP module, applying a torque of 10 Ncm (14 oz inches).

Step 2 Perform the NBP module specification test as described in this manual.

NBP Pump

The NBP pump inflates the pressure cuff





To Remove the NBP Pump

Step 1 Using a small screwdriver or similar tool, unplug the white 4-pin connector from the socket through the access hole on the top rear module casing.

Step 2 Grip and pull the red pump block assembly from the air inlet connector and the module assembly.

To Replace the NBP Pump

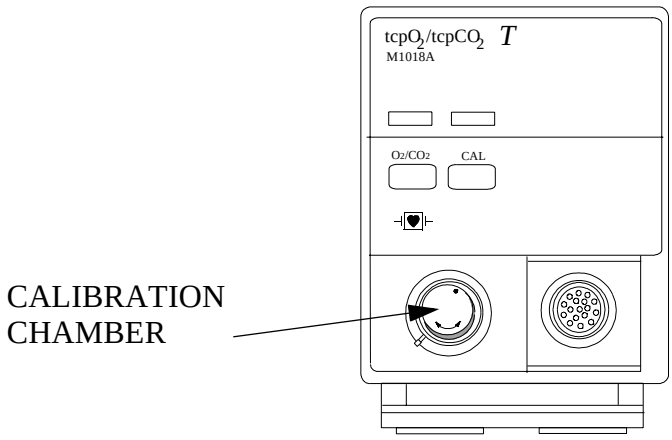
Step 1 Remove the protective cap from the air inlet connector on the pump module.

Step 2 Facing the front of the module, locate the pump assembly into the left side of the module assembly. Ensure the air inlet tube fits properly into the air inlet connector of the pump.

Step 3 Using a small screwdriver or similar tool, plug the white 4-pin connector into the socket on the module assembly. To gain access to the connector, carefully lift the PCB on the opposing side of the module assembly.

Step 4 Once the pump is in place, locate the PCB into its original position and reassemble the module. Perform the NBP module specification test in this manual. Calibration is required if the test fails.

$tcpO_2/tcpCO_2$ Calibration Chamber Kit



To Remove the Calibration Chamber

Step 1 Using a flat-tipped screwdriver, remove the screw holding the calibration chamber in place on the front of the plug-in module.

Step 2 Lift the chamber off the plug-in module. Ensure that the white plastic switch tip located in the module is not lost.

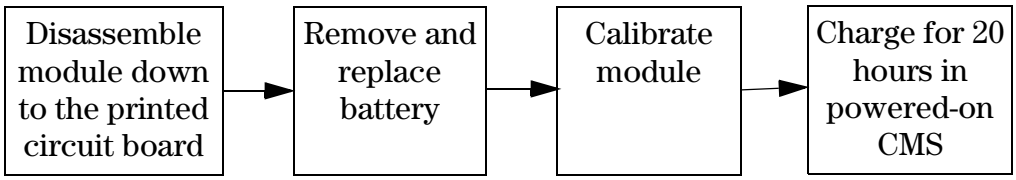
To Replace the Calibration Chamber

Step 1 Ensure the white plastic switch tip is in place in the plug-in module.

Step 2 Place the calibration chamber in the allocated position on the plug-in module.

Step 3 Insert and tighten the screw into the calibration chamber, securing it to the plug-in module.

FIO_2 Battery Replacement


Disassemble module down to the printed circuit board
Remove and replace battery
Calibrate module
Charge for 20 hours in powered-on CMS

To Replace the FIO_2 Battery

Step 1 Remove the printed circuit boards from the frame by releasing the two catches.

Step 2 Unsolder the battery.

Step 3 Discard the battery according to local regulations.

Step 4 Solder the new battery into place.

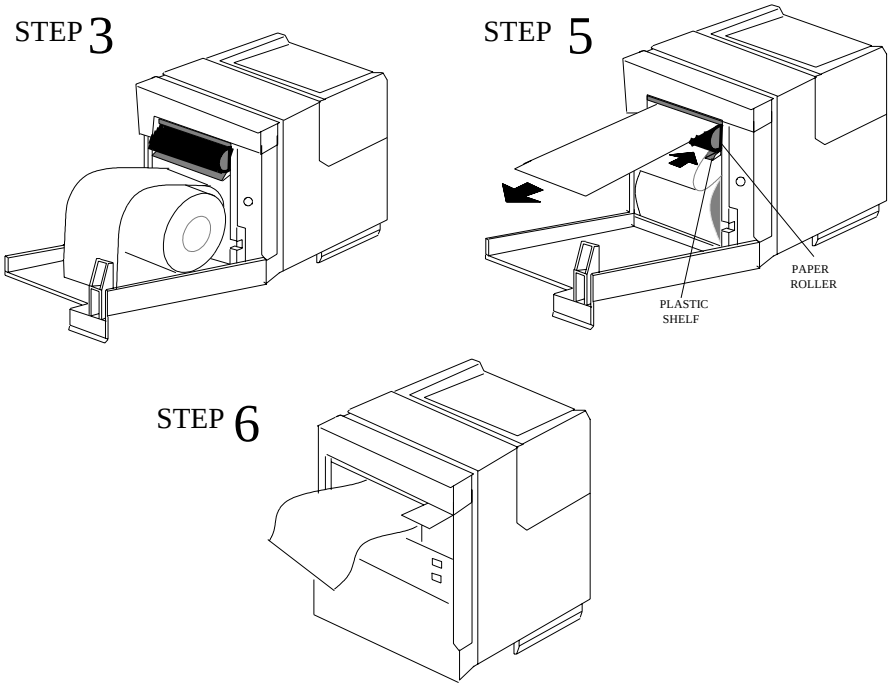
Step 5 Reassemble the module, being careful to snap-lock all catches back into place.

Step 6 Perform 21% and 100% calibration, as described in the *User's Reference Manual*.

Step 7 Leave the module in a powered-on CMS for 20 hours to charge battery.

Recorder Module Paper

The recorder will not run when the door is open or when the recorder is out of paper. To prevent damage to the recorder module, use only Philips approved paper (Philips re-order number 40477A/B)



To Load Paper into the Recorder Module

Step 1 Remove the empty core from the previous roll of paper.

Step 2 Cut off and discard the first few inches of paper to eliminate any traces of adhesive.

Step 3 Pull out several inches of paper from the new roll, holding the roll with the loose end hanging over the top toward you.

Step 4 Open the door and push the paper roll into the holders in the recorder.

Step 5 Thread the paper under the roller and over the plastic shelf far enough so it goes around the roller and comes out above it.

Step 6 Drape the paper over the end of the door and close the door. The paper should be visible and draped down in front of the door.

Chapter 6 Parts List for CMS

This chapter provides the replacement and exchange part numbers (if available) for the Philips CMS Patient Monitoring System. Exploded views of the Computer Module and Display Module are provided to assist in identifying certain parts.

Objective

To provide you with a list of available parts for the CMS.

Concepts

The circuit boards used in the monitor contain Surface Mounted Devices (SMD) which can only be repaired with special equipment, not available in the field. For this reason, the majority of the parts used in the system can only be replaced at board level.

Overview

Table 6-1 Overview of Replaceable Parts for the Monitor

Topic	Page
14” CRT Displays	6-3
Flatscreen Displays	6-10
External Alarm Device	6-14
Fuses	6-14
Computer Module	6-15
Upgrade Tools and Miscellaneous Parts	6-22
Plug-In Modules	6-25
Plug-in Module Racks	6-32
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Patient Connectors and Accessories	6-34
General	6-34
ECG & ECG/Respiration Module Accessories	6-34
Pressure Module Accessories	6-37
Non-Invasive Pressure Module Accessories	6-38
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Sidestream CO2 Module Accessories	6-42
SvO2 Module Accessories	6-42
FIO2 Module Accessories	6-43
SpO2 Module Accessories	6-44
Temperature Module Accessories	6-44
tcpO2/tcpCO2 Module Accessories	6-45
Thermal Array Recorder Module Accessories	6-45
Blood Analysis Module Accessories	6-45
EEG Module Accessories	6-46
VueLink Test Module Parts	6-46

14” CRT Displays

The color-dependent parts that can can be replaced on the 14” CRT Displays are listed in the following table:

NOTE Along with all Membrane Switches always order a Retaining Clip (p/n 0510-1637)

Table 6-2 CRT Display - Color-dependent Replaceable Parts

Old (Darker) Color		New (Lighter) Color		Description (see exploded views)	
Exchange Part Number	New Part Number	Exchange Part Number	New Part Number		
M1094-68002	M1094-60002	M1094-68004	M1094-60004	M1094B MONITOR 14” COLOR	
M1092-68001	M1092-60001	M1092-68004	M1092-60004	M1092A MONITOR 14” MONO	
	M1105-60501		M1105-60511	FRONT ASSY DISP M1094A/M1094B	2
	M1104-60501		M1104-60511	FRONT ASSY DISP M1092A	2
			M1104-61760	STANDARD MEMBRANE SWITCH POLISH	4
			M1104-61758	STANDARD MEMBRANE SWITCH CZECH	4
			M1104-61757	STANDARD MEMBRANE SWITCH RUSSIAN	4
			M1104-61755	STANDARD MEMBRANE SWITCH GREEK	4
	M1104-61953		M1104-61753	STANDARD MEMBRANE SWITCH SIMPLIFIED CHINESE	4
	M1104-61952		M1104-61752	STANDARD MEMBRANE SWITCH TRADITIONAL CHINESE	4
	M1104-61951		M1104-61751	STANDARD MEMBRANE SWITCH KANJI, JAPANESE	4
	M1104-61950		M1104-61750	STANDARD MEMBRANE SWITCH DANISH	4
	M1104-61949		M1104-61749	STANDARD MEMBRANE SWITCH NORWEGIAN	4
	M1104-61948		M1104-61748	STANDARD MEMBRANE SWITCH FINNISH	4
	M1104-61947		M1104-61747	STANDARD MEMBRANE SWITCH SWEDISH	4
	M1104-61946		M1104-61746	STANDARD MEMBRANE SWITCH ITALIAN	4
	M1104-61945		M1104-61745	STANDARD MEMBRANE SWITCH SPANISH	4
	M1104-61944		M1104-61744	STANDARD MEMBRANE SWITCH DUTCH	4
	M1104-61943		M1104-61743	STANDARD MEMBRANE SWITCH GERMAN	4

Table 6-2 CRT Display - Color-dependent Replaceable Parts

Old (Darker) Color		New (Lighter) Color		Description (see exploded views)	
Exchange Part Number	New Part Number	Exchange Part Number	New Part Number		
	M1104-61942		M1104-61742	STANDARD MEMBRANE SWITCH FRENCH	4
	M1104-61941		M1104-61741	STANDARD MEMBRANE SWITCH ENGLISH	4
	M1104-61933			CLASSIC MEMBRANE SWITCH SIMPLIFIED CHINESE	4
	M1104-61932			CLASSIC MEMBRANE SWITCH TRADITIONAL CHINESE	4
	M1104-61931			CLASSIC MEMBRANE SWITCH KANJI, JAPANESE	4
	M1104-61930			CLASSIC MEMBRANE SWITCH DANISH	4
	M1104-61929			CLASSIC MEMBRANE SWITCH NORWEGIAN	4
	M1104-61928			CLASSIC MEMBRANE SWITCH FINNISH	4
	M1104-61927			CLASSIC MEMBRANE SWITCH SWEDISH	4
	M1104-61926			CLASSIC MEMBRANE SWITCH ITALIAN	4
	M1104-61925			CLASSIC MEMBRANE SWITCH SPANISH	4
	M1104-61924			CLASSIC MEMBRANE SWITCH DUTCH	4
	M1104-61923			CLASSIC MEMBRANE SWITCH GERMAN	4
	M1104-61922			CLASSIC MEMBRANE SWITCH FRENCH	4
	M1104-61921			CLASSIC MEMBRANE SWITCH ENGLISH	4
	M1104-61911			CLASSIC MEMBRANE SWITCH KANJI, JAPANESE (w/o SUSPEND KEY)	4
	M1104-61907			CLASSIC MEMBRANE SWITCH SWEDISH (w/o SUSPEND KEY)	4
	M1104-61906			CLASSIC MEMBRANE SWITCH ITALIAN (w/o SUSPEND KEY)	4
	M1104-61905			CLASSIC MEMBRANE SWITCH SPANISH (w/o SUSPEND KEY)	4
	M1104-61904			CLASSIC MEMBRANE SWITCH DUTCH (w/o SUSPEND KEY)	4
	M1104-61903			CLASSIC MEMBRANE SWITCH GERMAN (w/o SUSPEND KEY)	4
	M1104-61902			CLASSIC MEMBRANE SWITCH FRENCH (w/o SUSPEND KEY)	4
	M1104-61901			CLASSIC MEMBRANE SWITCH ENGLISH (w/o SUSPEND KEY)	4

Table 6-2 CRT Display - Color-dependent Replaceable Parts

Old (Darker) Color		New (Lighter) Color		Description (see exploded views)	
Exchange Part Number	New Part Number	Exchange Part Number	New Part Number		
			089094877MOL	STANDARD BEZEL OVERLAY ENGLISH	
			089094878MOL	STANDARD BEZEL OVERLAY FRENCH	
			089094879MOL	STANDARD BEZEL OVERLAY GERMAN	
			089094880MOL	STANDARD BEZEL OVERLAY DUTCH	
			089094881MOL	STANDARD BEZEL OVERLAY SPANISH	
			089094882MOL	STANDARD BEZEL OVERLAY ITALIAN	
			089094883MOL	STANDARD BEZEL OVERLAY TRADITIONAL CHINESE	
			089094884MOL	STANDARD BEZEL OVERLAY SWEDISH	
			089094885MOL	STANDARD BEZEL OVERLAY FINNISH	
			089094886MOL	STANDARD BEZEL OVERLAY NORWEGIAN	
			089094887MOL	STANDARD BEZEL OVERLAY SIMPLIFIED CHINESE	
			089094888MOL	STANDARD BEZEL OVERLAY DANISH	
			089094889MOL	STANDARD BEZEL OVERLAY KANJI, JAPANESE	
			089095185MOL	STANDARD BEZEL OVERLAY PORTUGUESE	
			089095476MOL	STANDARD BEZEL OVERLAY GREEK	
			089095475MOL	STANDARD BEZEL OVERLAY RUSSIAN	
			089095474MOL	STANDARD BEZEL OVERLAY POLISH	
	89092814MOL			CLASSIC BEZEL OVERLAY ENGLISH	
	89092993MOL			CLASSIC BEZEL OVERLAY FRENCH	
	89092994MOL			CLASSIC BEZEL OVERLAY GERMAN	
	89092995MOL			CLASSIC BEZEL OVERLAY DUTCH	
	89092996MOL			CLASSIC BEZEL OVERLAY SPANISH	
	89092997MOL			CLASSIC BEZEL OVERLAY ITALIAN	
	89092998MOL			CLASSIC BEZEL OVERLAY SWEDISH	
	89092999MOL			CLASSIC BEZEL OVERLAY FINNISH	
	89093171MOL			CLASSIC BEZEL OVERLAY NORWEGIAN	
	89093173MOL			CLASSIC BEZEL OVERLAY JAPANESE	
	89093174MOL			CLASSIC BEZEL OVERLAY TRADITIONAL CHINESE	
	89093175MOL			CLASSIC BEZEL OVERLAY SIMPLIFIED CHINESE	

Table 6-2 CRT Display - Color-dependent Replaceable Parts

Old (Darker) Color		New (Lighter) Color		Description (see exploded views)	
Exchange Part Number	New Part Number	Exchange Part Number	New Part Number		
	89093870MOL			CLASSIC BEZEL OVERLAY ENGLISH (w/o SUSPEND KEY)	
	89093871MOL			CLASSIC BEZEL OVERLAY FRENCH (w/o SUSPEND KEY)	
	89093872MOL			CLASSIC BEZEL OVERLAY GERMAN (w/o SUSPEND KEY)	
	89093873MOL			CLASSIC BEZEL OVERLAY DUTCH (w/o SUSPEND KEY)	
	89093874MOL			CLASSIC BEZEL OVERLAY SPANISH (w/o SUSPEND KEY)	
	89093875MOL			CLASSIC BEZEL OVERLAY ITALIAN (w/o SUSPEND KEY)	
	89093876MOL			CLASSIC BEZEL OVERLAY SWEDISH (w/o SUSPEND KEY)	
	89093877MOL			CLASSIC BEZEL OVERLAY JAPANESE (w/o SUSPEND KEY)	
	M1104-47402		M1104-47412	ROTARY KNOB HIF (THUMBWHEEL)	
	M1104-47401		M1104-47411	KNOB POWER	5
	M1104-44101		M1104-44111	COVER CONNECTOR	6
	M1104-44102			CLEAR PLASTIC SHIELD	
	M1104-00201		M1104-00301	PANEL BLANK	4
	311920406672FMI		311920407511FMI	REAR ENCLOSURE M1094B/M1094A/ M1092A DISPLAY	15
	311920808962FMI		31192013074FMI	REAR COVER	14

The color-independent parts that can be replaced on the 14” CRT Displays are listed in this table:

Table 6-3 CRT Display Module - Color-independent Replaceable Parts

Exchange Part Number	New Part Number	Description (see exploded views)	
	311920809500FMI	M1094A SMPS	1
	991920860092FMI	M1094A CRT BOARD ASSY	
	311920809471FMI	M1094A DEFLECTION ASSY (For S/N ≥ 3014I07762)	
	M1094-74001	M1094A DEFLECTION ASSY & CRT Board (For S/N < 3014I07762)	
	M1094-60111	AC DELAY LINE RELAY FOR 220-240V	
	311920809490FMI	M1094A INTERFACE ASSY	
	991920863401FMI	M1094B SMPS	1
	991920863381FMI	M1094B VIDEO ASSY	
	991920863391FMI	M1094B DEFLECTION ASSY	
M1092-68501	311920809530FMI	M1092A SMPS	1
	991920857901FMI	M1092A DEFLECTION & VIDEO ASSY	
	M1105-88400	LOCKING CLIP	
	M1105-88410	CLIP, COMPONENT MONITORING SYSTEM BEZEL, PK=100	
	M1104-61602	CABLE ASSEMBLY (without TONE MODULATION)	
	M1104-85051	HIF CPU F/W (without TONE MODULATION)	
	1820-7777	HIF CPU F/W (inc. TONE MODULATION)	
	M1104-66505	BOARD ASSY HIF	3
	M1104-44102	CLEAR PLASTIC SHIELD	
	5041-4264	FOOT	7
	5041-4265	CAM, LOCKING	8
	2110-0365	FUSE T4A M1092A/M1094A/B (UL, 110V POWER SUPPLY)	9
	242208625096FMI	FUSE T2A M1092A (VDE, 220V POWER SUPPLY)	9
	242208601266FMI	FUSE T2A M1092A (UL, 220V POWER SUPPLY)	9
	242208610219FMI	FUSE T2.5A M1094A (VDE, 220V POWER SUPPLY)	9
	242208610009FMI	FUSE T2.5A M1094A (UL, 220V POWER SUPPLY)	9
	242208610239FMI	FUSE T3.15A M1094B (VDE or UL, 220V POWER SUPPLY)	9
	2110-1025	Fuse T3.15A M1046B Power Supply	
	2110-0567	FUSE HOLDER (220V) & M1046B Power Supply	
	2110-0565	FUSE HOLDER (110V)	
	1990-1259	POWER LED (on HIF)	
	0510-1637	RETAINING CLIP (Bezel)	
	311920809661FMI	POWER SWITCH ASSY M1094A (for S/N > 2950I07333)	10
	311920809660FMI	POWER SWITCH ASSY M1094A (for S/N ≤ 2950I07333)	10
	311920851940FMI	LINE FILTER ASSY M1094A	11
	311920809640FMI	FUSE ASSEMBLY M1094A	12
	311920809633FMI	POWER SWITCH ASSY M1092A (for S/N > 2950I07633)	10
	311920809630FMI	POWER SWITCH ASSY M1092A (for S/N ≤ 2950I07633)	10
	311920880721FMI	POWER SWITCH ASSY M1094B	
	311920809620FMI	VIDEO/Philips-HIL CONNECTOR PCA	13
	240325723322FMI	LOUDSPEAKER	
	991920712201FMI	M1094B REAR COVER SERVICE KIT	

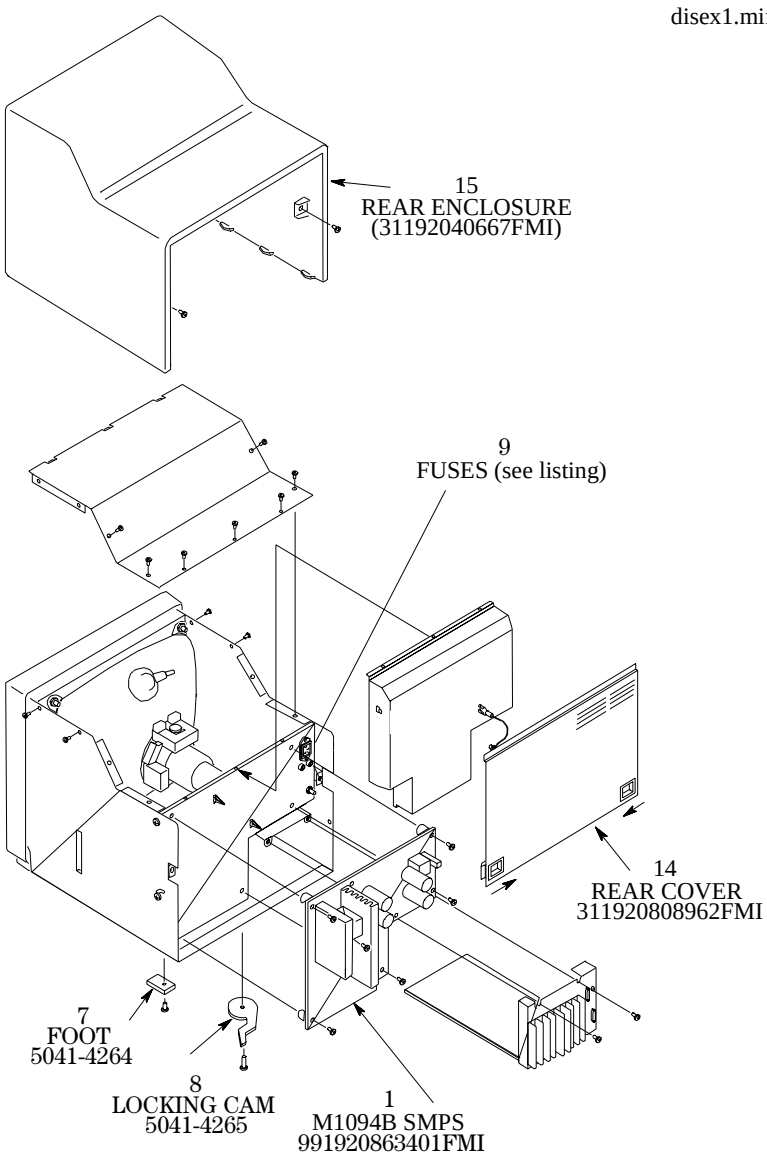


Figure 6-1 Display Module Exploded View M1094B

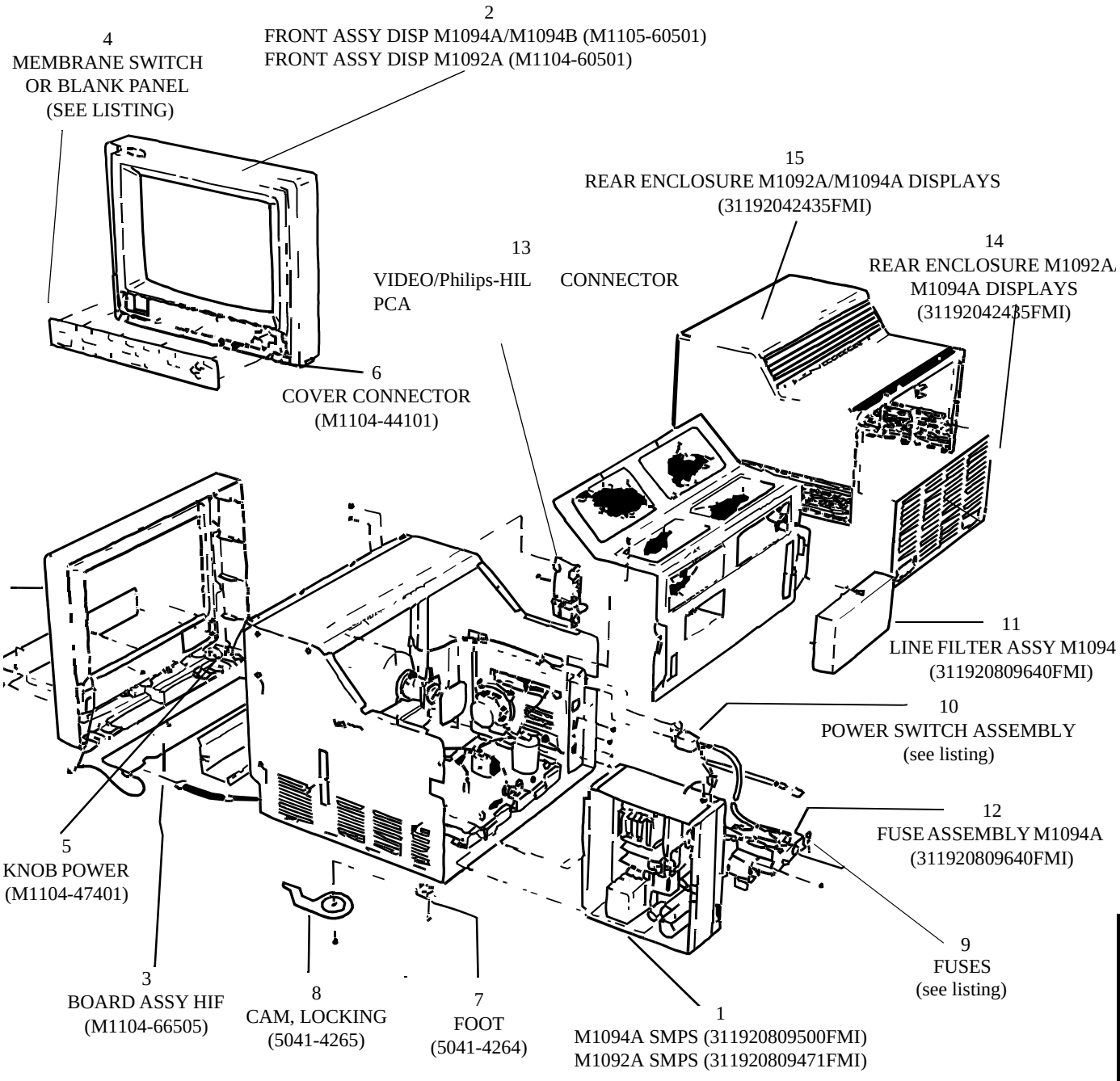


Figure 6-2 Display Module Exploded View M1092A/M1094A

Flatscreen Displays

The parts that can be replaced on Old Color M1095A Flatscreen Displays are listed in this table.

Table 6-4 Old Color M1095A Flatscreen Display - Replaceable Parts

Exchange Part Number	New Part Number	Description
M1095-68001	M1095-60001	Flatscreen Assembly (English)
M1095-68002	M1095-60002	Flatscreen Assembly (French)
M1095-68003	M1095-60003	Flatscreen Assembly (German)
M1095-68004	M1095-60004	Flatscreen Assembly (Dutch)
M1095-68005	M1095-60005	Flatscreen Assembly (Spanish)
M1095-68006	M1095-60006	Flatscreen Assembly (Italian)
M1095-68007	M1095-60007	Flatscreen Assembly (Swedish)
M1095-68008	M1095-60008	Flatscreen Assembly (Finnish)
M1095-68009	M1095-60009	Flatscreen Assembly (Norwegian)
M1095-68010	M1095-60010	Flatscreen Assembly (Danish)
M1095-68011	M1095-60011	Flatscreen Assembly (Kanji, Japanese)
M1095-68012	M1095-60012	Flatscreen Assembly (Trad. Chinese)
M1095-68013	M1095-60013	Flatscreen Assembly (Sim. Chinese)
M1095-68014	M1095-60014	Flatscreen Assembly (Portuguese)
M1095-68000	M1095-60000	Flatscreen Assembly (Blank)
M1095-68501	M1095-66501	Video Board
	M1095-61941	Keypad (English)
	M1095-61942	Keypad (French)
	M1095-61943	Keypad (German)
	M1095-61944	Keypad (Dutch)
	M1095-61945	Keypad (Spanish)
	M1095-61946	Keypad (Italian)
	M1095-61947	Keypad (Swedish)
	M1095-61948	Keypad (Finnish)
	M1095-61949	Keypad (Norwegian)
	M1095-61950	Keypad (Danish)
	M1095-61951	Keypad (Kanji, Japanese)
	M1095-61952	Keypad (Trad. Chinese)
	M1095-61953	Keypad (Sim. Chinese)
	M1095-61954	Keypad (Portuguese)
	0510-1637	Push-on clips for keypad
	M1095-65201	Housing kit (front, back and lightpipe)

Table 6-4 Old Color M1095A Flatscreen Display - Replaceable Parts

Exchange Part Number	New Part Number	Description
	M1095-68300	Loudspeaker (including cable)
	M1104-66551	HIF Board
	2090-0546	Backlight (for Preventive Maintenance) *Note: only for M1095A serial numbers with prefix less than 3805G.*
	M1095-44101	Plastic cover for HIL input
	M1104-47402	Brightness control (thumbwheel)
	M1095-02303	Cable holder video cable
	M1095-04602	Anti-glare screen
	0590-0199	2 x Nuts for video cable

The parts that can be replaced on M1095A Flatscreen Displays with the new lighter color exterior plastic parts, identified with the CMS logo on the bezel, are listed in this table:

Table 6-5 CMS New Color M1095A Flatscreen - Replaceable Parts

Exchange Part Number	New Part Number	Description
M1095-68101	M1095-60101	Flatscreen Assembly (English)
M1095-68102	M1095-60102	Flatscreen Assembly (French)
M1095-68103	M1095-60103	Flatscreen Assembly (German)
M1095-68104	M1095-60104	Flatscreen Assembly (Dutch)
M1095-68105	M1095-60105	Flatscreen Assembly (Spanish)
M1095-68106	M1095-60106	Flatscreen Assembly (Italian)
M1095-68107	M1095-60107	Flatscreen Assembly (Swedish)
M1095-68108	M1095-60108	Flatscreen Assembly (Finnish)
M1095-68109	M1095-60109	Flatscreen Assembly (Norwegian)
M1095-68110	M1095-60110	Flatscreen Assembly (Danish)
M1095-68111	M1095-60111	Flatscreen Assembly (Kanji, Japanese)
M1095-68112	M1095-60112	Flatscreen Assembly (Trad. Chinese)
M1095-68113	M1095-60113	Flatscreen Assembly (Sim. Chinese)
M1095-68114	M1095-60114	Flatscreen Assembly (Portuguese)
M1095-68115	M1095-60115	Flatscreen Assembly (Greek)
M1095-68117	M1095-60117	Flatscreen Assembly (Russian)
M1095-68120	M1095-60120	Flatscreen Assembly (Polish)

Table 6-5 CMS New Color M1095A Flatscreen - Replaceable Parts

Exchange Part Number	New Part Number	Description
M1095-68100	M1095-60100	Flatscreen Assembly (Blank)
	M1095-61741	Keypad (English)
	M1095-61742	Keypad (French)
	M1095-61743	Keypad (German)
	M1095-61744	Keypad (Dutch)
	M1095-61745	Keypad (Spanish)
	M1095-61746	Keypad (Italian)
	M1095-61747	Keypad (Swedish)
	M1095-61748	Keypad (Finnish)
	M1095-61749	Keypad (Norwegian)
	M1095-61750	Keypad (Danish)
	M1095-61751	Keypad (Kanji, Japanese)
	M1095-61752	Keypad (Trad. Chinese)
	M1095-61753	Keypad (Sim. Chinese)
	M1095-61754	Keypad (Portuguese)
	M1095-61755	Keypad (Greek)
	M1095-61757	Keypad (Russian)
	M1095-61760	Keypad (Polish)
	M1095-61758	Keypad (Czech)
	M1095-65211	Housing kit (front, back and lightpipe)
	M1095-44111	Plastic cover for HIL input
	2090-0360	Backlight (for Preventive Maintenance) *Note: only for M1095A serial numbers with prefix equal to 3805G.*
	2090-0381	Backlight (for Preventive Maintenance) *Note: only for M1095A serial numbers with prefix greater than or equal to 3923G.*
	M1095-04602	Anti-glare screen
	0590-0199	2 x Nuts for video cable

The parts that can be replaced on the M1097A Flatscreen Displays are:

Table 6-6 CMS M1097 XGA Flatscreen Display (15")- Replaceable Parts

Part Number	Description
M1097-68001	15" Flatscreen Display Non-Touch version
M1097-68002	15" Flatscreen Display Touch capable version
M1097-60005	15" Flatscreen Display AC/DC adapter

The parts that can be replaced on the Remote Power Supply are:

Table 6-7 Remote Power Supply (M1047A) - Replaceable Parts

Part Number	Description
242208601263FMI	Fuse (4 A for 11 0V)
242208610239FMI	Fuse (3.15 V for 220/240 V)
2110-0565	Fuse holder (110 V)
2110-0567	Fuse holder (220 V) & M1046B
991920864111FMI	Remote control board
1990-1259	Power LED
311920880721FMI	Power switch assy
311920130301FMI	Rear cover
5041-4264	Feet
5041-4265	Cam lock

Table 6-8 Miscellaneous - Replaceable Parts

Part Number	Description
M1046-60060	Trackball (wireless)
M1046-60070	Trackball
M1181-61659	Power Supply Remote On/Off cable (kit)
M1181-61655	Video/DC cable (3m)
M1181-61656	Video/DC cable (10m)
M1095-65121	Tilt & swivel mount (supplied with C-Clamp)
M1180-60031	Fixed mount (supplied with C-Clamp)
M1180-60146	Flexible Mount (For Ohmeda equipment with dovetail connection
M1180-60147	Swing Arm Mount (For Ohmeda equipment with dovetail connection)
M1041-23201	C-Clamp

External Alarm Device

The External Alarm Device (only with Option H03/4 – the XGA-compatible display configuration) has the following replaceable parts:

Table 6-9 External Alarm Device (M1109A) - Replaceable Parts

New part number	Description
M1104-64100	Housing Assembly
M1106-00210	Handheld Keypad Bracket
M1104-66551	HIF Board (including ribbon cable)
M1104-66511	LED Carrier Board
M1095-68300	Loudspeaker
M1104-64110	Protection Flap for HIL Connectors
M1181-61659	Remote On/Off Cable

Fuses

Table 6-10 CMS Fuses

CRT Display Type / Power Supply Type	Line Voltage 100-120 V		Line Voltage 200-240 V		
	Fuse Rating	Part Number	Fuse Rating	Part Number	
				VDE	UL
M1092A Mono CRT Display (Main / Slave)	2 x T4.0 A	2110-0365	2 x T2.0 A	24220862 5096FMI	24220860 1266FMI
M1094A Color CRT Display (Main / Slave)	2 x T4.0 A	2110-0365	2 x T2.5 A	24220861 0219FMI	24220861 0009FMI
M1094B Color CRT Display (Main / Slave)	2 x T4.0 A	2110-0365	2 x T3.15 A H	242208610239FMI	
M1047A Remote Power Supply	2 x T4.0 A	2110-0365	2 x T3.15 A H	242208610239FMI	
M1046B Integral Power Supply	2 x T3.15 A H	2110-1025	2 x T3.15 A H	242208610239FMI	

Computer Module

The parts that can be replaced on either computer module are found in Table 6-11 Computer Module M1046A - Replaceable Parts. Parts exclusively for the existing computer module are marked M1046A only.
Parts exclusively for the new computer module M1046B are found in Table 6-12 Computer Module M1046B - Replaceable Parts.

Table 6-11 Computer Module M1046A - Replaceable Parts

Exchange Part Number	New Part Number	Description	
M1127-68***LLR***	M1127-66***LLR***	EPROM ASSY #2	
M1126-68***LLR***	M1126-66***LLR***	EPROM ASSY #1	
		LL: Language	
		13 = SIMPLIFIED CHINESE	
		12 = TRADITIONAL CHINESE	
		11 = DANISH (Rel. C only)	
		10 = JAPANESE, KANJI	
		09 = FINNISH (Rel. C only)	
		08 = SWEDISH	
		07 = NORWEGIAN (Rel. C only)	
		06 = ITALIAN	
		05 = SPANISH	
		04 = DUTCH	
		03 = GERMAN	
		02 = FRENCH (International)	
		01 = ENGLISH	
		R = Release	
		E = Rel. A (Rel. 2.0)	
		F = Rel. B (Rel. 2.5)	
		G = Rel. C (Rel. 3.0) Most languages	
		H = Japanese, Trad. Chinese, Simpl. Chinese Rel. C	
		I = French Homologated Rel. C	
M1088-68501	M1088-66501	Rack Interface Board	
M1086-68501	M1086-66501	HDLC Interface Board	
M1085-68501	M1085-66501	RS-232 Interface Board	
M1084-68501	M1084-66501	Analog Interface Board	
M1082-68501	M1082-66501	SDN Interface Board (OLD)	
M1082-68502	M1082-66502	SDN Interface Board (NEW) M1059-85025/85005 required.	
M1066-68531	M1066-66531	MONO DISPLAY Controller Board [a] **(M1046A only)**	

Table 6-11 Computer Module M1046A - Replaceable Parts

Exchange Part Number	New Part Number	Description	
M1066-68543	M1066-66543	MONO Display Controller Board (Western, Eastern Europe and Asian languages[b]) **(M1046A only)**	
M1072-68531	M1072-66531	COLOR Display Controller Board [a] **(M1046A only)**	
M1072-68543	M1072-66543	COLOR Display Controller Board (Western, Eastern Europe and Asian languages[b]) **(M1046A only)**	
M1074-68502	M1074-66502	DSPC_FLAT Flatscreen controller board (Western languages[b])	
M1074-68503	M1074-66503	DSPC_FLAT_ASIA Flatscreen controller board (Eastern Europe and Asian language[b, c])	
	M1071-66502	DSPC TRADITIONAL CHINESE ASSY- **(M1046A only)**	
	M1070-66502	DSPC SIMPLIFIED CHINESE ASSY- **(M1046A only)**	
	M1069-66502	DSPC JAPANESE, KANJI ASSY- **(M1046A only)**	
	M1067-66502	DSPC EASTERN EUROPE ASSY- **(M1046A only)**[b]	
M1059-68501	M1059-66501	BOARD ASSY UTIL.CPU	
M1056-68501	M1056-66501	SRAM HI (Data Management #C03 - Database extension)	
M1055-68501	M1055-66501	SRAM LO (Standard database)	
M1054-68501	M1054-66501	APP_CPU (10MHz)	
M1053-68515	M1053-66515	CPC (40MHz) WITH FLASH EPROM, NO SOFTWARE LOADED	
M1051-68501	M1051-66501	APP_CPU (15MHz)	
	M1088-85051	FE.IF CPU F/W	
	M1086-85022	HDLC F/W HI BYTE	
	M1086-85002	HDLC F/W LO BYTE	
	1821-1505	RS232 F/W Computer Interface Capability (large OTP)	
	M1085-85003	RS232 F/W Computer Interface Capability (small OTP)	
	1420-0375	BATTERY FOR S-RAM BOARD (M1055-66501 OR m1056-66501)	
	M1084-85051	ANALOG IF F/W	
	M1084-85001	ANALOG IF CPU F/W	
	M1072-85021	CPSPC CTRL F/W HIGH BYTE	
	M1072-85001	CDSPC CTRL F/W LOW BYTE	
	M1066-85021	DSPC.MONO F/W HIGH BYTE	
	M1066-85001	DSPC.MONO F/W LOW BYTE	
	M1059-85025	UTIL.CPU F/W HIGH BYTE	
	M1059-85005	UTIL.CPU F/W LOW BYTE	
	M1054-85021	CPU F/W HIGH BYTE (10MHz)	
	M1054-85001	CPU F/W LOW BYTE (10MHz)	
	M1051-85022	CPU F/W HIGH BYTE (15MHz)	
	M1051-85002	CPU F/W LOW BYTE (15MHz)	
	M1046-66501	BOARD ASSY BACKPLANE	1
	M1046-64101	INSERT INDENT	2
	M1046-60101	F.BOX COMMON UNIT	

Table 6-11 Computer Module M1046A - Replaceable Parts

Exchange Part Number	New Part Number	Description	
	M1046-44112	COVER REAR	3
	M1046-44111	COVER SIDE	4
	M1046-04151	COVER TOP	7
	M1046-43101	GUIDE PCB	5
	M1046-04110	COVER SLOT BLANK	6
	M1046-04108	COVER FRONT PLATE (10MHz & 15MHz CPU systems)	
	M1053-00015	COVER FRONT PLATE (40MHz CPC based systems)	
	M1053-00014	CPC CONNECTOR COVER	
	M1046-01202	BRACKET RIGHT	8
	M1046-01201	BRACKET LEFT	9
	M1046-00201	CHASSIS BOTTOM	10
M1043-68101	M1043-60101	INTEGRAL RACK	16
	M1043-60102	BLANK RACK	
	M1043-40211	BLANK FRONT COVER	
	5001-1320	R.F.I SPRING	11
	0950-1954	DC/DC CONVERTER	12
	5041-4264	FOOT	13
	5041-4265	CAM LOCKING	14
	1818-4869	BLANK EEPROM (32K x 8 250NS)	
	2110-0830	FUSE 1.25A, 250V (For Utility CPU, New Revision)	
	2110-0517	FUSE 2A, 125 V (For Utility CPU, Old Revision)	
	1400-1589	POWER CORD RETAINER	
	0515-0842	POWER CORD RETAINER SCREW	
	8120-2961	EXTERNAL GROUND CABLE ASSY (Crocodile clip)	
	8120-4808	EXTERNAL GROUND CABLE ASSY (ground lug connector)	
	M1046-44901	CARD EXTRACTOR TOOL	
	M1046-44301	LABEL FOR COMPUTER MODULE SLOTS	

a. Requires: M1067-66502 for use with Eastern European languages
M1069-66502 for use with Japanese
M1071-66502 for use with Chinese Traditional
M1070-66502 for use with Chinese Simplified

b. Language groups for Display Controllers:
Western: English, German, Dutch, Italian, French, Spanish, Portuguese, Danish, Norwegian, Swedish
Eastern Europe: Russian, Greek, Polish, Czech
Asian: Japanese, Chinese traditional, Chinese simplified

c. See “Configuring the Display Controller Card” on page 5-55

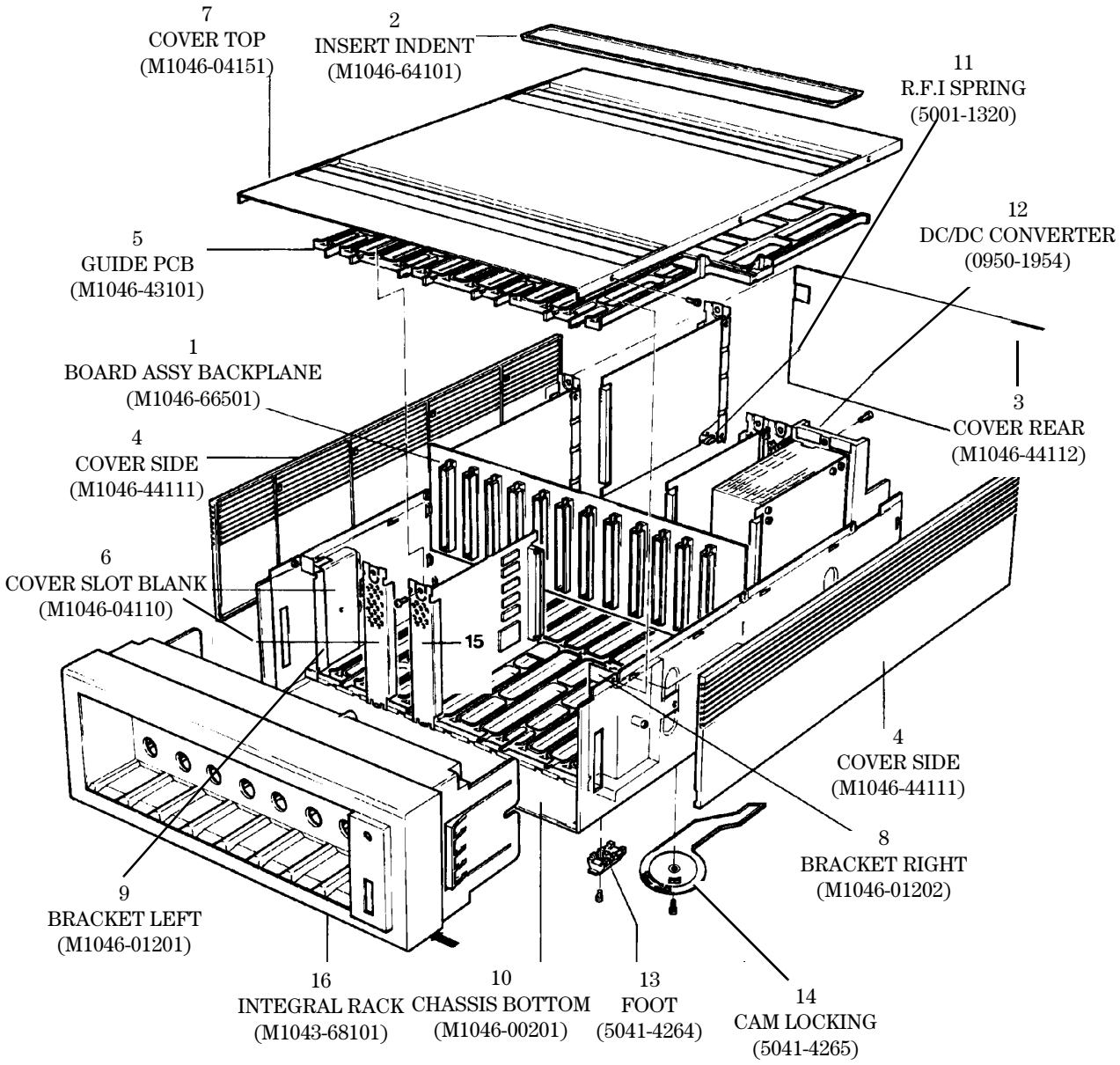


Figure 6-3 Computer Module M1046A - Exploded View

The replacement parts **exclusively** for the Computer Module M1046B are:

Table 6-12 Computer Module M1046B - Replaceable Parts

Exchange Part Number	New Part Number	Description	
	M1046-60004	Kit Spacer Assembly including 5 Screws M3*14 - (0515-1280) Standoff for Locking Cam - (M1046-44702) 4 Standoffs for Feet - (M1046-44701)	 1 2 3
	M1046-02301	Function Card Locking Plate	4
	M1046-60002	Metal Sheet Cover Assembly including, ECG sync adaptor retainer, and ECG sync adaptor retainer screw	5 8 9
M1046-68053	M1046-60053	Integral Power Supply and heat sink assembly	6
	M1046-64102	Plastic Front Cover incl. light	7
	M1046-63202	ECG sync adaptor	
	M1046-66502	REMOTE_SWITCH function card - **(Slot 8)**	10
	M1046-66503	AUX_CONNECTOR function card - **(Slot 24)**	11
	M1046-00151	Chassis Bottom	
	M2300-61625	Shorting Stub for DC / DC converter	
M1075-68502	M1075-66502	CDSPC_XGA Display controller board (Western languages[a])	
M1075-68503	M1075-66503	CDSPC_XGA Display controller board (Eastern Europe and Asian languages[a, b])	
	2110-1025	Fuse (T3.15A)	
	2110-0567	Fuse holder	
	8120-1703	Power Cord with 90-degree angle	

a. Language Groups for Display Controllers:

Western: English, German, Dutch, Italian, French, Spanish, Portuguese, Danish, Norwegian, Swedish, Finnish

Eastern Europe: Russian, Greek, Polish, Czech

Asian: Japanese, Chinese traditional, Chinese simplified

b. See “Configuring the Display Controller Card” on page 5-55

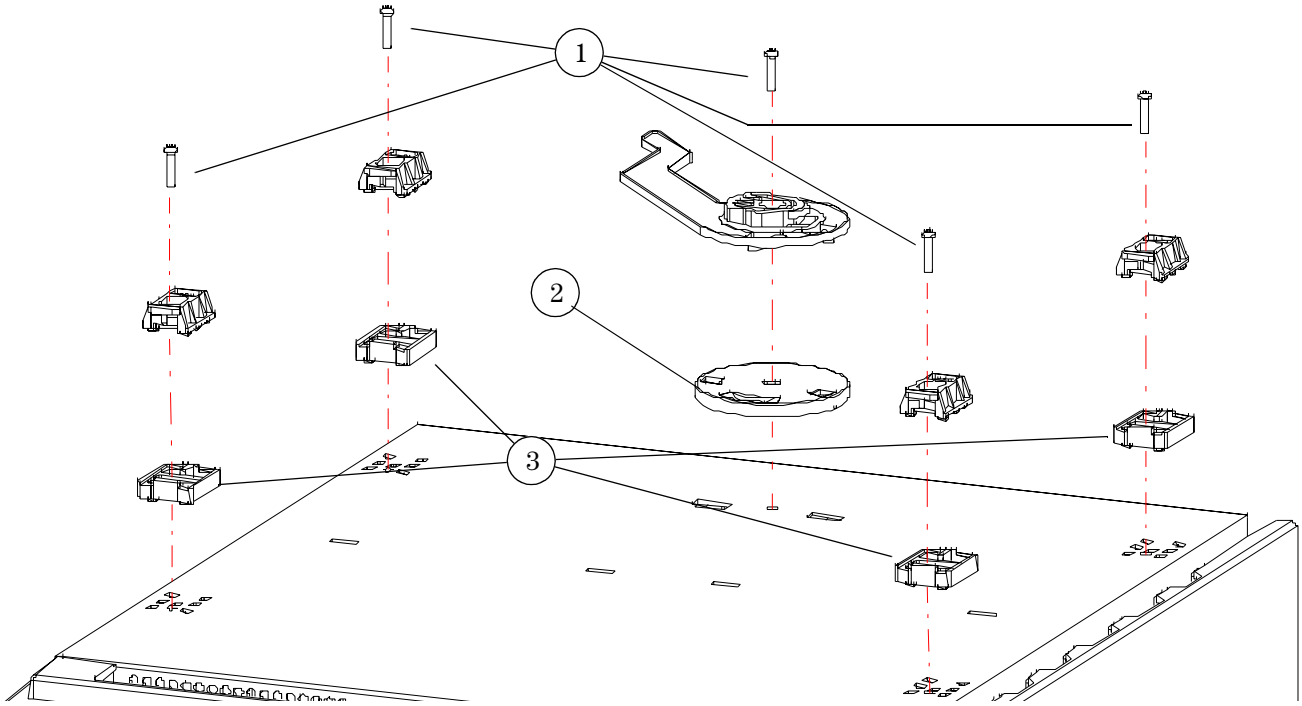


Figure 6-4 Computer Module M1046B - Standoffs for Feet and Locking Cam

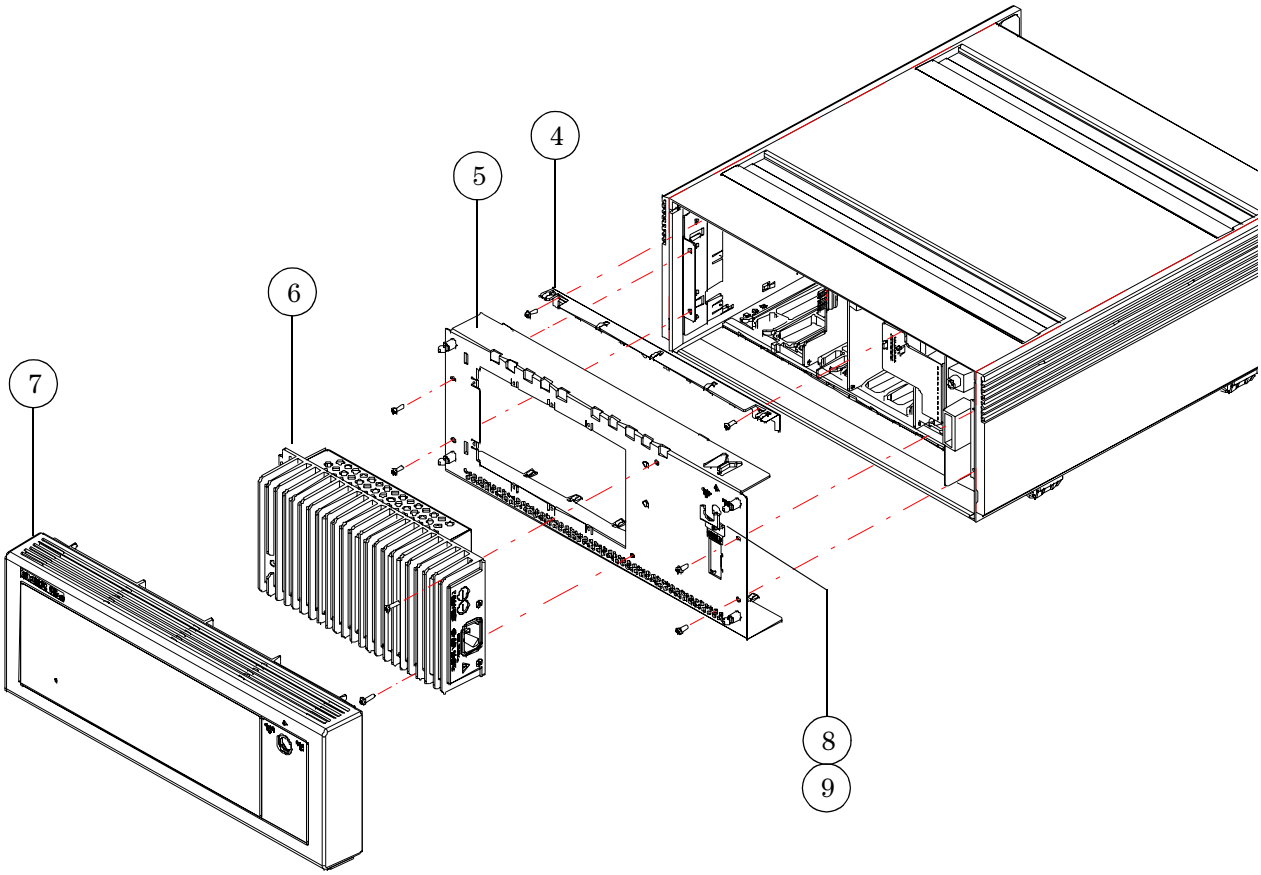


Figure 6-5 Computer Module M1046B - Exploded View

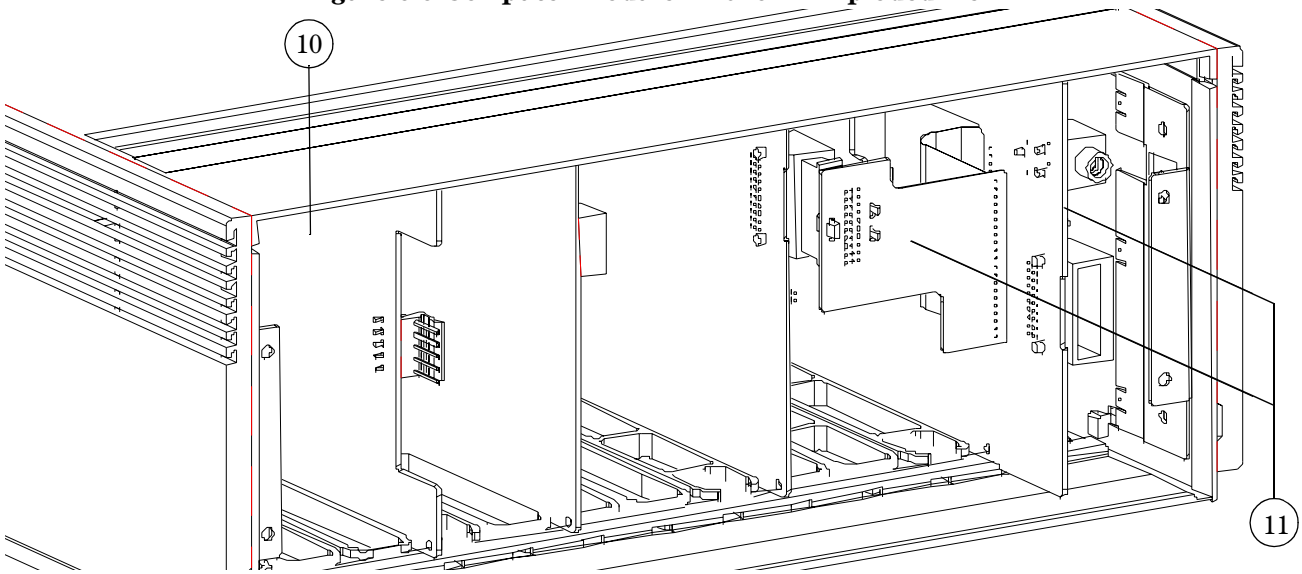


Figure 6-6 Computer Module M1046B - Remote Switch & Aux Connector Function Cards

Upgrade Tools and Miscellaneous Parts

Table 6-13 Upgrade Tools & Miscellaneous Parts

Exchange Part Number	New Part Number	Description
	M2300-67100	CPC PROGRAMMING TOOL KIT
	M2300-67200	SERVICE PORT RIBBON CABLE
	M2300-67210	GROUND CABLE
M1130-80***LLR***	M1130-10***LLR***	CPC PROGRAMMING CARD **(**PHILIPS **INTERNAL USE ONLY)** **Only for CMS Releases up to Rel. B.0 (Rel. 9.0)**
M1130-81***LLR***	M1130-11***LLR***	CPC PROGRAMMING CARD **only for** CMS **Releases up to Rel. B.0 (Rel. 9.0)**
		LL: Language
		20 = POLISH
		17 = RUSSIAN
		15 = GREEK
		14 = PORTUGUESE
		13 = SIMPLIFIED CHINESE (PRC)
		12 = TRADITIONAL CHINESE (TAIWAN)
		11 = DANISH
		10 = JAPANESE, KANJI
		09 = FINNISH
		08 = SWEDISH
		07 = NORWEGIAN
		06 = ITALIAN
		05 = SPANISH
		04 = DUTCH
		03 = GERMAN
		02 = FRENCH (International)
		01 = ENGLISH
		R: Release
		G = Rel. C (Rel. 3.0) Most languages
		H = Japanese, Trad. Chinese, Simpl. Chinese Rel. C
		I = French Homologated Rel. C
		K = Rel. D (Rel. 4.0)
		L = Rel. E (Rel. 5.0)
		M = Rel. Eβ (Rel. 5.5)
		P = Rel. F (Rel. 6.0)
		U = Rel. G (Rel. 7.0)
		V = Rel. A.0 (Rel. 8.0)
		W = Rel. B.0 (Rel. 9.0)

Table 6-13 Upgrade Tools & Miscellaneous Parts

Exchange Part Number	New Part Number	Description
M1130-82***LLR***	M1130-12***LLR***	CPC PROGRAMMING CARD **(**PHILIPS **INTERNAL USE ONLY)** **ONLY FOR** CMS **RELEASE C.0 AND GREATER**
M1130-83***LLR***	M1130-13***LLR***	CPC PROGRAMMING CARD **Only for** CMS **Release C.0 and greater**
		LL: Language
		18 = CZECH
		20 = POLISH
		17 = RUSSIAN
		15 = GREEK
		14 = PORTUGUESE
		13 = SIMPLIFIED CHINESE (PRC)
		12 = TRADITIONAL CHINESE (TAIWAN)
		11 = DANISH
		10 = JAPANESE, KANJI
		09 = FINNISH
		08 = SWEDISH
		07 = NORWEGIAN
		06 = ITALIAN
		05 = SPANISH
		04 = DUTCH
		03 = GERMAN
		02 = FRENCH (International)
		01 = ENGLISH
		R: Release
		A = Rel. C.0 (rel. 10.0)
	M1186-6601G	UPGRADE TOOL “ORANGE” - REV C (Philips **INTERNAL USE ONLY**)
	M1186-6611G	CLONING TOOL “ORANGE” - REV C (BIOMED)
	M1186-45001	EEPROM REMOVAL TOOL
	M1046-44901	CARD EXTRACTOR TOOL
	M1181-66501	HIL EXTENDER BOARD “F-BOX” (White connector)
	M1181-66502	HIL EXTENDER BOARD “Display” (Black connector)
	5962-4340	Serial-to-Parallel Converter for connecting 25-pin serial RS-232 printer cable to parallel port
	0515-1146	Screw for PC board

Table 6-14 Overview of C.0./C.1 Software Release

Exchange Part Number	New Part Number	Description	
M1130-80***LLR***	M1130-12***LLR***	CPC PROGRAMMING CARD **(**PHILIPS **INTERNAL USE ONLY) ONLY FOR** CMS **RELEASE UP TO REL. C.0 AND GREATER**	
M1130-81***LLR***	M1130-13***LLR***	CPC PROGRAMMING CARD (FOR BIOMED USE) **ONLY FOR CMS RELEASE C.0 AND GREATER**	
		LL: Language	
		20 = POLISH	
		18 = CZECH	
		17 = RUSSIAN	
		15 = GREEK	
		14 = PORTUGUESE	
		13 = SIMPLIFIED CHINESE (PRC)	
		12 = TRADITIONAL CHINESE (TAIWAN)	
		11 = DANISH	
		10 = JAPANESE, KANJI	
		09 = FINNISH	
		08 = SWEDISH	
		07 = NORWEGIAN	
		06 = ITALIAN	
		05 = SPANISH	
		04 = DUTCH	
		03 = GERMAN	
		02 = FRENCH (International)	
		01 = ENGLISH	
		R: Release	**Service Notes**
		A = Rel. C.0 (rel. 10.0)	M1046A-071, M1046B-014
		B = Rel. C.0 (rel. 17.36)	M1046A-072, M1046B-15
		C = Rel. C.0 (rel. 17.37)	M1046A-073/5, M1046B-016/18
		D = Rel. C.0 (rel. 17.52)	M1046A-079, M1046B-022, M1046A-076A, M1046B-19A, M1020A-013, M1001A-005, M1002-008, M1001B-002, M1002B-005, M1012A-004A, M1046A-071
		E = Rel. C.1 (rel. 17.62)	

Plug-In Modules

The following table shows the part-numbers of the plug-in modules that can be replaced. Find the right number for your language combining the P/N-Prefix with the language-specific suffix for the wanted module. E.g.: To order a TEMP module for a French language CMS, the correct order number would be M1029-68801.

Table 6-15 Plug-In Modules - Replaceable Modules (New Color)

Module Type	P/N Prefix	Language Suffixes												
		US English	English	French	German	Dutch	Spanish	Italian	Norwegian	Swedish	Finish	Japanese	Danish	Chinese
BLANK MODULE	M1180-64	511	511	511	511	511	511	511	511	511	511	511	511	511
DATA TRANSFER	M1235-68	601	601	602	602	602	602	602	602	602	602	602	602	602
M1116*A* or M1116B THERMAL ARRAY RECORDER	M1116-68	521	521	522	523	521	525	526	528	528	528	530	521	533
VUELINK AUXILIARY #A01	M1032-68	701	801	801	801	801	801	801	801	801	801	801	801	801
VUELINK VENTILATOR #A02	M1032-68	702	802	802	802	802	802	802	802	802	802	802	802	802
VUELINK GAS ANALYZER #A03	M1032-68	703	803	803	803	803	803	803	803	803	803	803	803	803
VUELINK ANESTHESIA MACHINE #A04	M1032-68	704	804	804	804	804	804	804	804	804	804	804	804	804
VUELINK AUXILIARY PLUS #A05	M1032-68	705	805	805	805	805	805	805	805	805	805	805	805	805
TEMP	M1029-68	701	801	801	801	801	801	801	801	801	709	710	801	713
EEG	M1027-68	601	601	601	601	601	601	601	601	601	601	610	601	601
BLOOD ANALYSIS	See Table 6-16 on page 6-26													
$S\bar{v}O_2$	M1021-68	551	551	551	551	551	551	551	551	551	551	551	551	551
SpO_2/PLETH	M1020-68	603	603	603	603	603	605	605	605	605	605	610	605	613
$tcpO_2$/$tcpCO_2$	M1018-68	601	601	601	601	601	601	601	601	601	601	610	601	601
FIO_2	M1017-68	603	603	603	603	603	603	603	603	603	603	610	603	613
CO_2	M1016-68	601	701	701	701	701	701	701	701	701	701	610	701	613
SIDESTREAM CO_2	M1015-68	601	601	601	601	601	601	601	601	601	601	601	601	601
C.O.	M1012-68	601	701	602	603	701	605	606	701	701	701	610	701	613
C.O. #C10	M1012-68	631	631	632	633	631	635	636	631	631	631	641	631	643
NBP Venous Puncture	M1008-68	803	811	812	811	814	815	816	817	818	811	820	811	823
NBP (Non-VP)	M1008-68	503	603	512	603	514	515	516	517	518	603	520	603	523
M1006B INV. PRESSURE	M1006-68	621	721	632	633	634	635	721	637	638	639	640	721	643
M1006B Option #C01 IABP	M1006-68	625	725	662	663	664	665	666	667	668	669	670	725	673
ECG (M1001A)	M1001-68	603	703	703	653	703	703	703	657	657	657	670	703	673
ECG (M1001B)	M1001-68	611	611	611	613	611	611	611	617	617	617	620	611	623
ECG/RESP (M1002A)	M1002-68	603	703	703	653	703	703	703	657	657	657	670	703	673
ECG/RESP (M1002B)	M1002-68	611	611	611	613	611	611	611	617	617	617	620	611	623
ECG/RESP Option #CO1	M1002-68	625	625	625	633	625	625	625	625	625	625	625	625	625
BIS	M1034-68	500	500	500	500	500	500	500	500	500	500	500	500	500

Table 6-16 Blood Analysis Plug-In Module - Replaceable Modules

Exchange P/N	New P/N	Country
M1022-68531	M1022-60531	USA
M1022-68532	M1022-60532	France
M1022-68533	M1022-60533	Austria/Germany
M1022-68534	M1022-60534	Netherlands
M1022-68535	M1022-60535	Spain
M1022-68536	M1022-60536	Italy
M1022-68537	M1022-60537	Norway
M1022-68538	M1022-60538	Sweden
M1022-68539	M1022-60539	Finland
M1022-68540	M1022-60540	Japan
M1022-68541	M1022-60541	Denmark
M1022-68542	M1022-60542	Traditional Chinese
M1022-68543	M1022-60543	Simplified Chinese
M1022-68544	M1022-60544	Portuguese
M1022-68551	M1022-60551	UK
M1022-68552	M1022-60552	Canada
M1022-68553	M1022-60553	Austria
M1022-68554	M1022-60554	Switzerland
M1022-68555	M1022-60555	Latin America and others

Table 6-17 Plug-In Modules - Replaceable Parts

Part Number	Description	
M1008-47201	NBP INLET CONNECTOR INSERT	
M1008-60003	NBP PUMP	
M1018-67901	$tcpO_2/CO_2$CALIBRATION CHAMBER KIT - Old Color	
M1018-67911	$tcpO_2/CO_2$CALIBRATION CHAMBER KIT - New Color	
M1022-68000	FOAM FILTER FOR VENTILATOR FAN for M1022A (PACK OF 5)	
M1022-68070	COVER FOR VENTILATOR FILTER for M1022A (PACK OF 5)	
M1027-61601	EEG MODULE TEST DEVICE	
M1032-44111	VUELINK MODULE LED COVER	
M1032-45211	VUELINK MODULE FRONT FRAME	
M1116-40041	TOP HOUSING (FITS M1116 *A* & M1116 *B* MODELS)	
M1116-40240	FRONT HOUSING, M1116 *B* (DOOR)	
M1116-60201	M1116B RECORDER CLEANING KIT	
M1116-60400	REAR CONNECTOR (M1116A, M1116B)	
M1116-83002	LABEL, INSIDE DOOR, TRANSPARENT, M1116 *B* (LOAD PAPER)	
M1235-60010	DTM MAIN BOARD AND FRONT PANEL ASSBLY	
1252-2655	C.O. #C10 CONNECTOR	9
1252-2708	C.O. #C10 CONNECTOR BEZEL (ORANGE)	11
1252-2655	C.O. CONNECTOR	9
1252-2708	C.O. CONNECTOR BEZEL (ORANGE)	11
3101-3021	CHERRY SWITCH (DOOR OPEN SENSOR, M1116A ONLY)	

Table 6-17 Plug-In Modules - Replaceable Parts *(Continued)*

Part Number	Description	
1252-2657	CO_2 CONNECTOR	9
1252-2706	CO_2 CONNECTOR BEZEL (LIGHT GREY)	11
1252-2656	ECG or ECG/RESP CONNECTOR	9
1252-2709	ECG or ECG/RESP CONNECTOR BEZEL (WHITE)	11
1420-0374	FIO_2 BATTERY	
1252-2661	FIO_2 CONNECTOR	9
1252-2712	FIO_2 CONNECTOR BEZEL (BLUE)	11
5061-8310	FRAME KIT	4 & 5
5041-4254	FRAME MIDDLE	6
5040-4256	HOUSING FRONT, DOUBLE MODULE	3
5040-4250	HOUSING FRONT, SINGLE MODULE	2
5041-8135	HOUSING, DOUBLE MODULE	
5040-4249	HOUSING, SINGLE MODULE	
5041-9702	IABP HOUSING FRONT, DOUBLE (M1006A #C01)	
1990-0698	LED PARAM MODULE	7
1252-2659	M1006A PRESS CONNECTOR	9
1252-5681	M1006B PRESS CONNECTOR	9
1252-2663	MODULE REAR CONNECTOR	
1252-5618	MODULE REAR CONNECTOR (M1006B, M1032A)	
1252-5618	MODULE REAR CONNECTOR (NEW)	
1252-2663	MODULE REAR CONNECTOR (OLD)	
1252-2714	NBP CONNECTOR BEZEL (RED)	
1252-2702	PHONE JACK SOCKET for M1006B #C01	
1252-2715	PRESS CONNECTOR BEZEL (RED)	11
5040-4247	SNAP LOCK SINGLE	10
1252-2654	SpO_2 CONNECTOR	9
1252-2707	SpO_2 CONNECTOR BEZEL (BLUE)	11
3101-2990	SWITCH PARAM MODULE	8
1252-4606	$tcpO_2/CO_2$ CONNECTOR BEZEL (BLACK)	11
1252-2660	TEMP CONNECTOR	9
1252-2711	TEMP CONNECTOR BEZEL (BROWN)	11
1252-4604	VUELINK CONNECTOR	9
1252-4605	VUELINK CONNECTOR BEZEL (DARK GREY)	11

Table 6-18 BIS Module - Replaceable Parts

Part Number	Description	
M1034-61630	BIS PIC (PATIENT INTERFACE CABLE)	14
M1034-61650	BIS SENSOR SIMULATOR	
M1034-68520	BIS ENGINE	12
M1034-68530	BIS DSC-3	13
M1034-61610	BIS MODULE CABLE (0.8 m)	11
M1034-61620	BIS MODULE CABLE (2.0 m)	11

Parts include:
(also shown on next page)
1. Typical overlay label
2. Housing front single
3. Housing front double
4. Frame right (Part of Frame Kit)
5. Frame left (Part of Frame Kit)
6. Frame middle
7. LED parameter module
8. Switch parameter module
9. Typical connector
10. Snap lock single
11. Typical Connector bezel

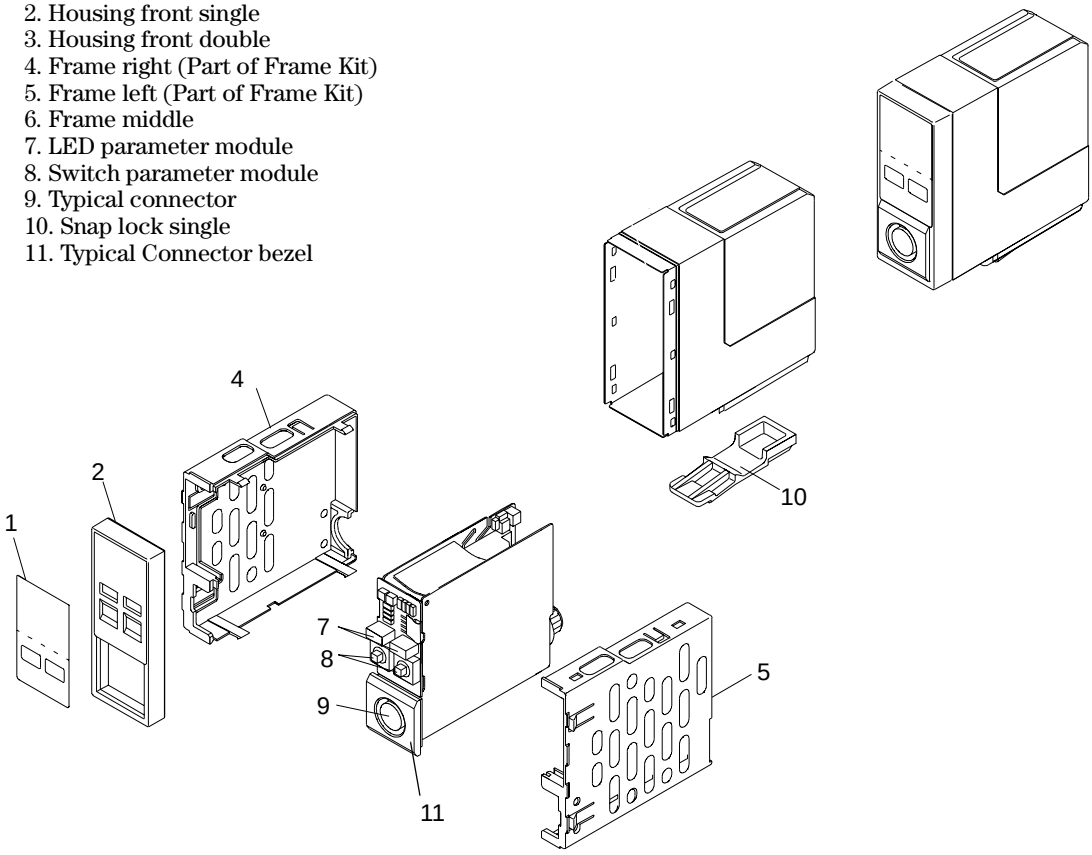


Figure 6-7 Single-width Plug-in Module Exploded View

Parts include:

1. Typical overlay label
2. Housing front single
3. Housing front double
4. Frame right (Part of Frame Kit)
5. Frame left (Part of Frame Kit)
6. Frame middle
7. LED parameter module
8. Switch parameter module
9. Typical connector
10. Snap lock single
11. Typical Connector bezel

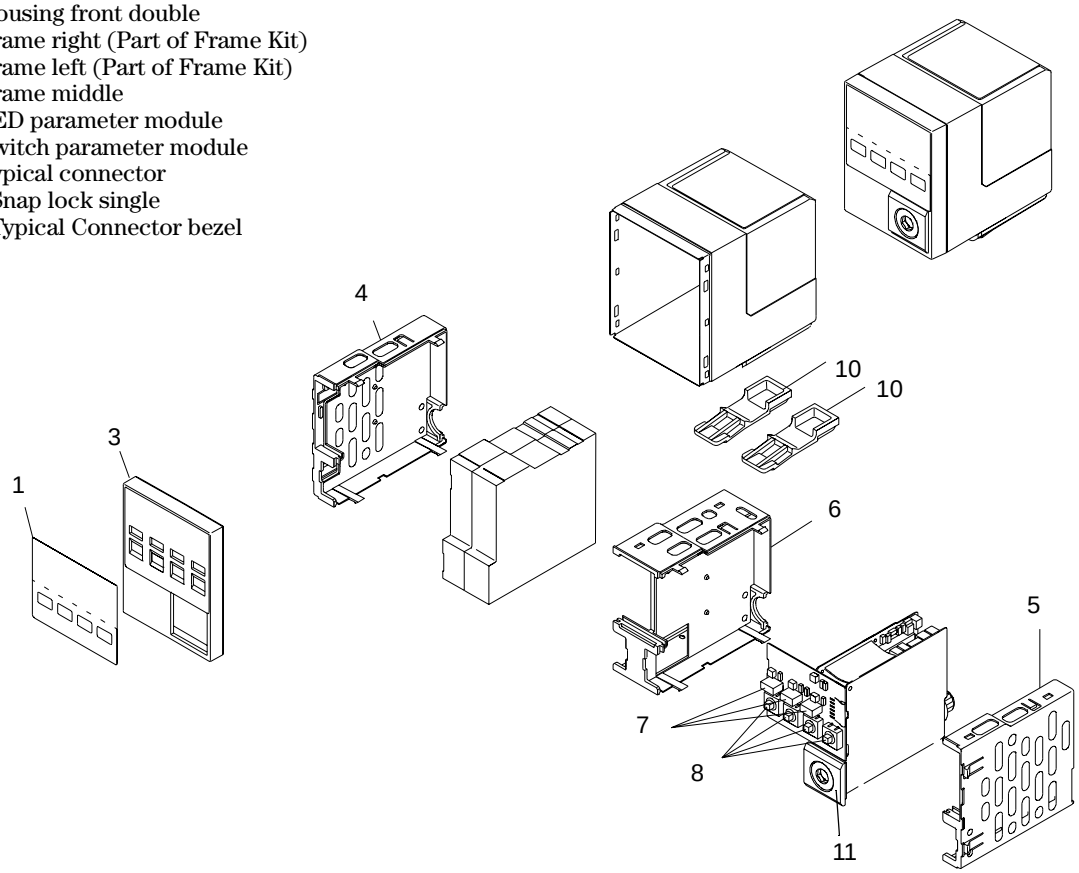


Figure 6-8 Double-width Plug-in Module Exploded View

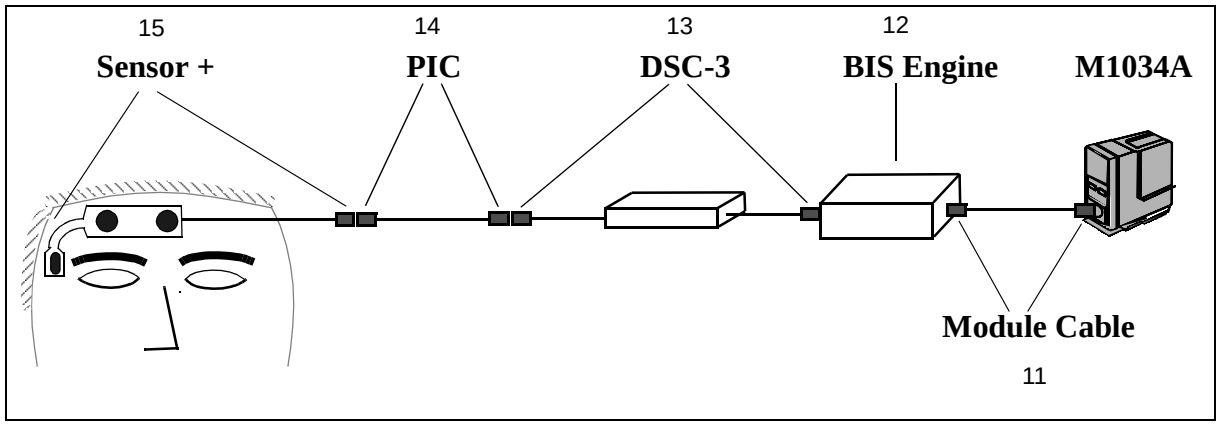


Figure 6-8 BIS Module Components

NOTE Module labels are not available for all of the languages available for the CMS.

Table 6-16 Plug-In Module Label Part Numbers with *T*

Module	Old (Dark) Color	New (Light) Color	Chinese	Japanese	Italian	Spanish	French	English	Dutch	Danish	German	Finnish	Norwegian	Swedish
VueLink	M1032-443xx	M1032-444xx	'01	'01	'01	'01	'01	'01	'01	'01	'01	'01	'01	'01
Temp	M1029-443xx	M1029-444xx	'82	'81	'71	'71	'71	'71	'71	'71	'71	'78	'71	'71
EEG	—	M1027-443xx	‘71	‘81	‘71	‘71	‘71	‘71	‘71	‘71	‘71	‘71	‘71	‘71
$S\bar{v}O_2$	M1021-443xx	M1021-444xx	-	'71	'71	'71	'71	'71	'71	'71	'71	'71	'71	'71
SpO_2/Pleth	M1020-443xx	M1020-444xx	'82	'81	'75	'75	'71	'71	'71	'71	'71	'71	'71	'75
$tcpO_2$/$tcpCO_2$	M1018-443xx	M1018-444xx	'71	'81	'71	'71	'71	'71	'71	'71	'71	'71	'71	'71
FIO_2	M1017-443xx	M1017-444xx	'82	'81	'71	'71	'71	'71	'71	'71	'71	'77	'71	'71
CO_2	M1016-443xx	M1016-444xx	'82	'81	'71	'71	'71	'71	'71	'71	'71	'77	'71	'71
C.O.	M1012-443xx	M1012-444xx	'82	'81	'76	'75	'72	'71	'71	'71	'73	'71	'71	'71
C.O. #C10	—	M1012-444xx	‘12	‘11	‘06	‘05	‘02	‘01	‘01	‘01	‘03	‘01	‘01	‘01
NBP *B* Ven Puncture.	—	M1008-444xx	‘82	‘81	‘76	‘75	‘72	‘71	‘74	–	‘73	‘71	‘79	‘77
NBP *B*	M1008-443xx	M1008-444xx	'52	'51	'46	'45	'42	'41	'44	'41	'43	'41	'49	'47
IABP *A*	M1006-443xx	—	'70	'68	'66	'65	'62	'70	'64	'70	‘63	'70	'69	'70
IABP *B*	M1006-444xx	M1006-445xx	‘32	‘31	‘26	‘25	‘22	‘21	'24	-	‘23	‘28	‘29	‘27
Pressure *A*	M1006-443xx	—	'82	'81	'71	'75	'72	'71	'74	'71	'73	'78	'79	'77
Pressure *B*	M1006-444xx	M1006-445xx	'12	'11	'01	'05	'02	'01	'04	'01	'03	'08	'09	'07
ECG/Resp (A)	M1002-443xx	M1002-444xx	'82	'81	'71	'71	'71	'71	'71	'71	'73	'77	'77	'77
ECG/Resp (B)	—	M1002-44xxx	‘502	‘501	‘491	‘491	‘491	‘491	'91	'91	'93	'97	'97	'97
ECG/Resp #C01	M1002-443xx	M1002-444xx	‘21	‘21	‘21	‘21	‘21	‘21	‘21	‘21	‘23	‘21	‘21	‘21
ECG (A)	M1001-443xx	M1001-444xx	'82	'81	'71	'71	'71	'71	'71	'71	'73	'77	'77	'77
ECG (B)	—	M1001-44xxx	‘502	‘501	‘491	‘491	‘491	‘491	'91	'91	'93	'97	'97	'97
Data Transfer	M1235-830xx	M1235-831xx	‘00	‘00	‘00	‘00	‘00	‘01	‘00	‘00	‘00	‘00	‘00	‘00
Blood Analysis	—	M1022-444xx	‘52	‘50	‘46	‘45	‘42	‘41	‘44	‘51	‘43	‘49	‘47	‘48
BIS	—	M1034-444xx	‘01	‘01	‘01	‘01	‘01	‘01	‘01	‘01	‘01	‘01	‘01	‘01

Table 6-17 Plug-In Module Label Part Numbers without *T*

Module	Old (Dark) Color	Japanese	Swedish	Italian	Spanish	Dutch	German	French	English	Chinese
Recorder *A*	M1116-830xx	'90	'60	'50	'40	'20	'20	'10	'00	---
Recorder *B*	M1116-830xx	'28	'26	'29	'24	'23	'23	'25	'21	'27
SaO_2/Pleth	M1020-443xx	'11	'05	'05	'05	'01	'01	'01	'01	---
FIO_2	M1017-443xx	'11	'01	'01	'01	'01	'01	'01	'01	---
NBP *B*	M1008-443xx	'31	'27	'26	'25	'24	'23	'22	'21	---
NBP *A*	M1008-443xx	'11	'07	'06	'05	'04	'03	'02	'01	---
ECG/Resp	M1002-443xx	'11	'07	'01	'01	'01	'03	'01	'01	---
ECG	M1001-443xx	'11	'07	'01	'01	'01	'03	'01	'01	---

Plug-in Module Racks

The parts that can be replaced on either the integral module rack or the satellite module rack are listed in the following table:

Table 6-18 Module Racks - Replaceable Parts

Exchange Part Number	New Part Number	Description
M1043-68101	M1043-60101	INTEGRAL RACK
M1041-68101	M1041-60101	SATELLITE RACK
	M1043-60102	BLANK RACK
	M1043-40211	BLANK FRONT COVER (for Blank Rack)
	M1041-44911	HANDLE EXT.RACK
	M1041-44112	COVER CONNECT (EXT RACK)
		MOUNTING CLAMP (EXT RACK)

Handheld Keypad

The following table lists the replaceable parts for the:

- M1106A Classic Handheld Keypad (without Suspend Key)
- M1106B Classic Handheld Keypad
- M1106C Standard Handheld Keypad (available in two colors)

Table 6-19 Handheld Keypad - Replaceable Parts

M1106A	M1106B	M1106C Old (Darker) Color	M1106C New (Lighter) Color	Description
M1106-66000	M1106-66100	M1106-66200	M1106-66400	HANDHELD KEYPAD (ENGLISH)
M1106-66001	M1106-66101	M1106-66201	M1106-66401	HANDHELD KEYPAD (FRENCH)
M1106-66002	M1106-66102	M1106-66202	M1106-66402	HANDHELD KEYPAD (GERMAN)
M1106-66003	M1106-66103	M1106-66203	M1106-66403	HANDHELD KEYPAD (DUTCH)
M1106-66004	M1106-66104	M1106-66204	M1106-66404	HANDHELD KEYPAD (SPANISH)
	M1106-66105	M1106-66205	M1106-66405	HANDHELD KEYPAD (ITALIAN)
	M1106-66106	M1106-66206	M1106-66406	HANDHELD KEYPAD (TRADITIONAL CHINESE)
	M1106-66109	M1106-66209	M1106-66409	HANDHELD KEYPAD (JAPANESE)
	M1106-66108	M1106-66208	M1106-66408	HANDHELD KEYPAD (SWEDISH)
	M1106-66116	M1106-66216	M1106-66414	HANDHELD KEYPAD (SIMPLIFIED CHINESE)
			M1106-66412	HANDHELD KEYPAD (PORTUGUESE)
	M1106-66111	M1106-66211	M1106-66411	HANDHELD KEYPAD (NORWEGIAN)

Table 6-19 Handheld Keypad - Replaceable Parts

M1106A	M1106B	M1106C Old (Darker) Color	M1106C New (Lighter) Color	Description
	M1106-66100	M1106-66210	M1106-66410	HANDHELD KEYPAD (FINNISH)
			M1106-66413	HANDHELD KEYPAD (GREEK)
			M1106-66415	HANDHELD KEYPAD (RUSSIAN)
			M1106-66416	HANDHELD KEYPAD (POLISH)
			M1106-66417	HANDHELD KEYPAD (CZECH)
	M1106-60300	M1106-60300	M1106-60400	HOUSING ASSEMBLY, TOP AND BOTTOM
	M1106-00110	M1106-00110	M1106-00210	MOUNTING BRACKET
M1106-60200	M1106-60200	M1106-60200	M1106-60200	CABLE ASSEMBLY

Table 6-20 Handheld Keypad - Overlay Part Numbers

M1106C	Description
M1106-43100	KEYPAD OVERLAY (ENGLISH)
M1106-43101	KEYPAD OVERLAY (FRENCH)
M1106-43102	KEYPAD OVERLAY (GERMAN)
M1106-43103	KEYPAD OVERLAY (DUTCH)
M1106-43104	KEYPAD OVERLAY (SPANISH)
M1106-43105	KEYPAD OVERLAY (ITALIAN)
M1106-43106	KEYPAD OVERLAY (TRADITIONAL CHINESE)
M1106-43108	KEYPAD OVERLAY (SWEDISH)
M1106-43109	KEYPAD OVERLAY (JAPANESE)
M1106-43110	KEYPAD OVERLAY (FINNISH)
M1106-43111	KEYPAD OVERLAY (NORWEGIAN)
M1106-43116	KEYPAD OVERLAY (SIMPLIFIED CHINESE)

Patient Connectors and Accessories

General

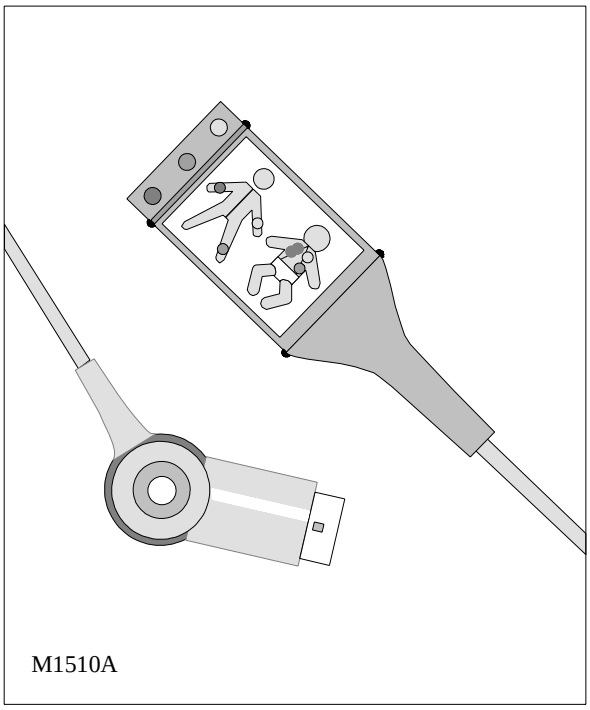
Table 6-21 General Accessories

New Part Number	Description
M2281A	Patient Cable Organizer (pack of 8 hooks)

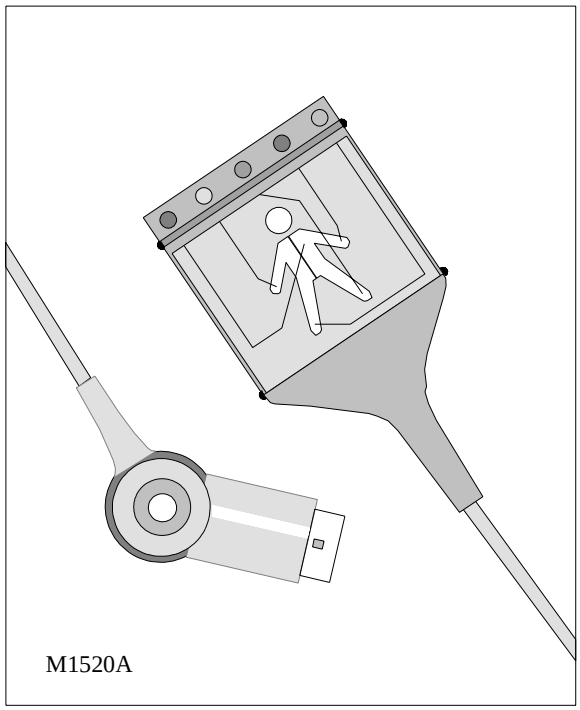
ECG & ECG/Respiration Module Accessories

The cabling and associated parts that can be ordered for the ECG and ECG/Respiration modules are:

mrx-ecg1



M1510A



M1520A

Table 6-22 ECG & ECG/Respiration Trunk Cables

	US Standard	IEC Standard
3 lead, 2.7m	M1500A	M1510A
3 lead, 0.4m	M1540C	M1550C
5 lead, 2.7m	M1520A	M1530A
5 lead, 0.4m	M1560A	M1570A

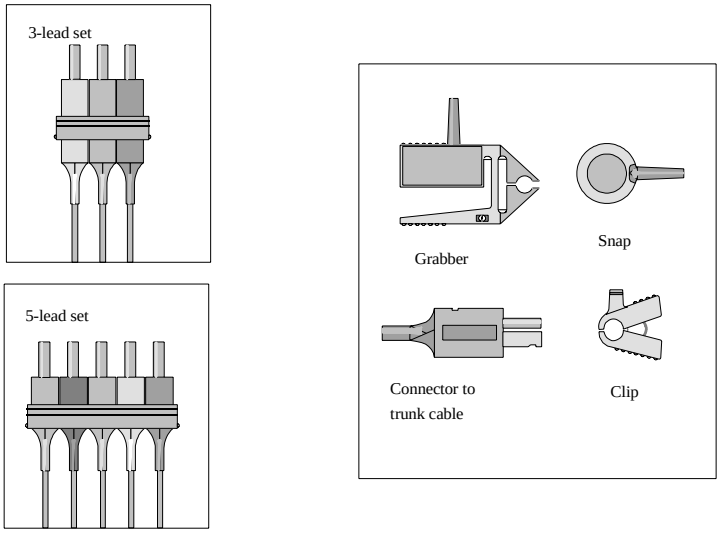


Table 6-23 ECG & ECG/Respiration One Piece Cables

	US Standard	IEC Standard
3 lead, OR, 1.9m	M1970A	M1980A
3 lead, ICU (Snap), 1.9m	M1972A	----
3 lead, ICU (Grabber), 1.9m	----	M1981A
5 lead, OR, 2.5m	M1975A	M1985A
5 lead, ICU (Snap), 2.5m	M1977A	----
5 lead, ICU (Grabber), 2.5m	----	M1986A

Table 6-24 ECG & ECG/Respiration OR Lead Sets

	US Standard	IEC Standard
OR 3 lead, 0.7m, Grabber	M1601A	M1611A
OR 5 lead, 0.7m 1.3m leg, Grabber	M1621A	M1631A

Table 6-25 ECG & ECG/Respiration Shielded Lead Sets

	US Standard	IEC Standard
Shielded 3 lead, 0.7m, Grabber	M1603A	M1613A
Shielded 3 lead, 0.7m, Snap	M1605A	M1615A
Shielded 5 lead, 0.7m (1.3m leg), Grabber	M1623A	M1633A

Table 6-25 ECG & ECG/Respiration Shielded Lead Sets

	US Standard	IEC Standard
Shielded 5 lead, 0.7m (1.3m leg), Snap	M1625A	M1635A

Table 6-26 ECG & ECG/Respiration Unshielded Lead Sets

	US Standard	IEC Standard
Unshld. 3 lead, 0.45m, Mini Clip	M1608A	M1618A
Unshld. 3 lead, 0.7m, Mini Clip	M1609A	M1619A
Unshld. 5 lead, 0.7m (1.3m leg), Mini Clip	M1629A	M1639A

Table 6-27 ECG & ECG/Respiration Single Leads

New Part Number	Description	New Part Number	Description
M1511A	Grabber, OR, 0.7m, Black	M1544A	Snap, STD, 0.7m, White
M1512A	Grabber, OR, 0.7m, Green	M1545A	Snap, STD, 0.7m, Yellow
M1513A	Grabber, OR, 0.7m, Red	M1546A	Snap, STD, 0.7m, Brown
M1514A	Grabber, OR, 0.7m, White	M1547A	Snap, STD, 1.3m, Black
M1515A	Grabber, OR, 0.7m, Yellow	M1548A	Snap, STD, 1.3m, Green
M1516A	Grabber, OR, 0.7m, Brown	M1549A	Snap, STD, 1.3m, Red
M1517A	Grabber, OR, 1.3m, Black	M1581A	Clip, Uns, 0.7m, Black
M1518A	Grabber, OR, 1.3m, Green	M1582A	Clip, Uns, 0.7m, Green
M1519A	Grabber, OR, 1.3m, Red	M1583A	Clip, Uns, 0.7m, Red
M1521A	Grabber, STD, 0.7m, Black	M1584A	Clip, Uns, 0.7m, White
M1522A	Grabber, STD, 0.7m, Green	M1585A	Clip, Uns, 0.7m, Yellow
M1523A	Grabber, STD, 0.7m, Red	M1586A	Clip, Uns, 0.7m, Brown
M1524A	Grabber, STD, 0.7m, White	M1587A	Clip, Uns, 1.3m, Black
M1525A	Grabber, STD, 0.7m, Yellow	M1588A	Clip, Uns, 1.3m, Green
M1526A	Grabber, STD, 0.7m, Brown	M1589A	Clip, Uns, 1.3m, Red
M1527A	Grabber, STD, 1.3m, Black	M1591A	Clip, Uns, 0.45m, Black
M1528A	Grabber, STD, 1.3m, Green	M1592A	Clip, Uns, 0.45m, Green
M1529A	Grabber, STD, 1.3m, Red	M1593A	Clip, Uns, 0.45m, Red
M1541A	Snap, STD, 0.7m, Black	M1594A	Clip, Uns, 0.45m, White
M1542A	Snap, STD, 0.7m, Green	M1595A	Clip, Uns, 0.45m, Yellow
M1543A	Snap, STD, 0.7m, Red		

Table 6-28 ECG & ECG/Respiration Cabling Accessories

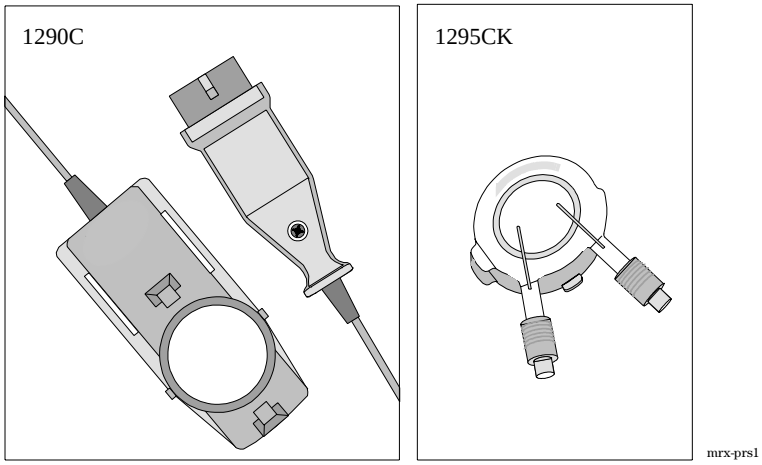
	for 3 lead sets	for 5 lead sets
Combiner block	M1501A	M1502A
Cable organizer (shielded and OR cables)	M1503A	M1504A
Cable organizer (unshielded cables)	M1505A	M1506A
Bedsheet clip, repositionable	M1509A	

Table 6-29 EASI Accessories

	US	Non-US
EASI Stickers	5967-2090	5967-2084

Pressure Module Accessories

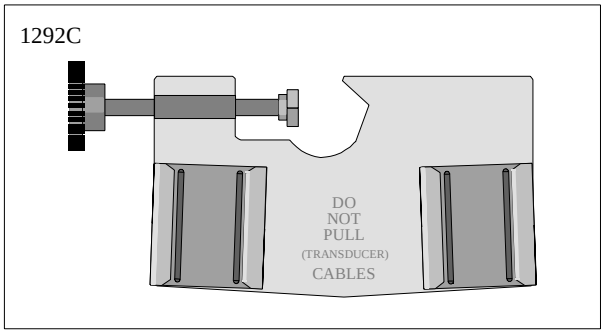
The following accessories can be ordered for the Pressure Module:



mrx-prs1

Table 6-30 PRESS Transducers & Adapter Cables

New Part Number	Description
1290C #J06	Pressure Transducer with 3m cable & 12-pin connector
1290C #J99-11	Pressure Transducer with 1m cable & 12-pin connector
1295CK	Sterile domes



mrx-prs2

Table 6-31 PRESS Transducer Accessories

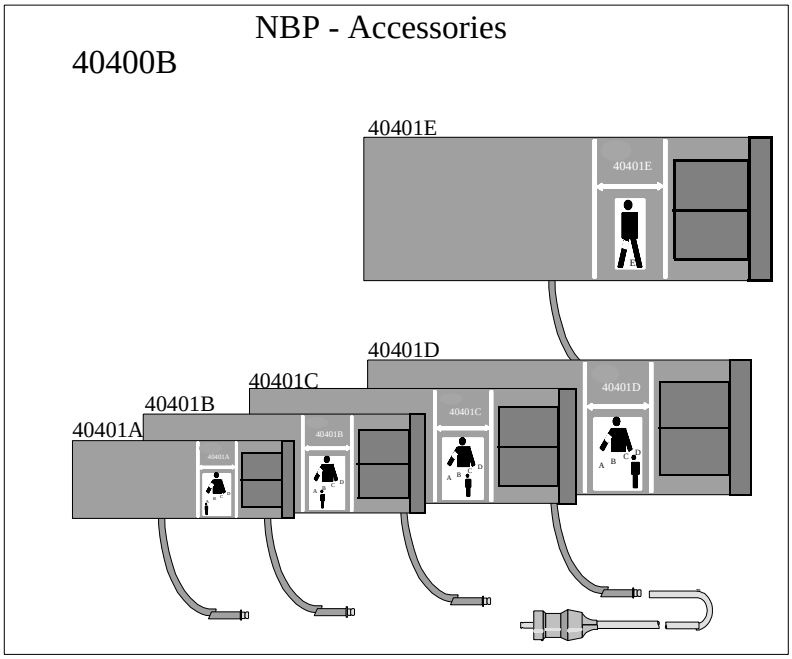
New Part Number	Description
1292C	Holder for two 1290C Transducers
1293C	Holder for three 1290C Transducers
1294C	Holder for four 1290C Transducers

Table 6-32 M1006B Pressure Module with Analog Output - Cables

New Part Number	Description
M1181A #A61	3 m IABP Cable
M1181A #A6B	25 m IABP Cable

Non-Invasive Pressure Module Accessories

The following accessories can be ordered for the Non-Invasive Pressure Module:



mrx-nbp

Table 6-33 Pressure Cuffs & Interconnection Cables

New Part Number	Description
40401A	Reusable pressure cuff, infant, 10-19cm
40401B	Reusable pressure cuff, pediatric, 18-26cm
40401C	Reusable pressure cuff, adult, 25-35cm
40401D	Reusable pressure cuff, large arm, 33-47cm
40401E	Reusable pressure cuff, thigh, 46-66cm
40400A	Reusable pressure cuff kit, includes 40401B/C/D
40400B	Reusable pressure cuff kit, includes 40401A/B/C/D/E
M1571A	Reusable Pressure cuff, infant, 12-17.5cm
M1572A	Reusable Pressure cuff, pediatric, 17-24cm
M1573A	Reusable Pressure cuff, small adult, 22-32cm
M1574A	Reusable Pressure cuff, adult, 27-37.5cm
M1575A	Reusable Pressure cuff, large adult, 37-51cm
M1576A	Reusable Pressure cuff, thigh size, 45-60cm
M1577A	Reusable Pressure cuff, kit, includes M1571/2/3/4A
M1578A	Reusable Pressure cuff, kit, includes M1573/4/5/6A
M1579A	Reusable Pressure cuff, kit, includes M1571/2/3/4/5/6A
M1874A	Non-sterile disposable pressure cuff, infant,12.0-17.5cm
M1875A	Non-sterile disposable pressure cuff, pediatric,17-24cm
M1808A/M1876A	Sterile/Non-sterile disposable pressure cuff, adult, 22-32cm

Table 6-33 Pressure Cuffs & Interconnection Cables

New Part Number	Description
M1809A/M1877A	Sterile/Non-sterile disposable pressure cuff, adult, 27-37.5cm
M1829A/M1078A	Sterile/Non-sterile disposable pressure cuff, adult, 37-51cm
M1879A	Non-sterile disposable pressure cuff, thigh, 45-60cm
M1867A/M1866A	Sterile/Non-sterile disposable neonatal cuff, size 1, 3.1-5.7cm
M1869A/M1868A	Sterile/Non-sterile disposable neonatal cuff, size 2, 4.3-8.0cm
M1879A/M1870A	Sterile/Non-sterile disposable neonatal cuff, size 3, 5.8-10.9cm
M1873A/M1872A	Sterile/Non-sterile disposable neonatal cuff, size 4,7.1-13.1cm
M1597	Neonatal interconnect cable, 3m
M1596	Neonatal interconnect cable, 1.5m
M1599	Adult interconnect cable, 3m
M1598	Adult interconnect cable, 1.5m
40401-40010	Cap for liquid seal

Cardiac Output Module Accessories

The following accessories can be ordered for the Cardiac Output Module:

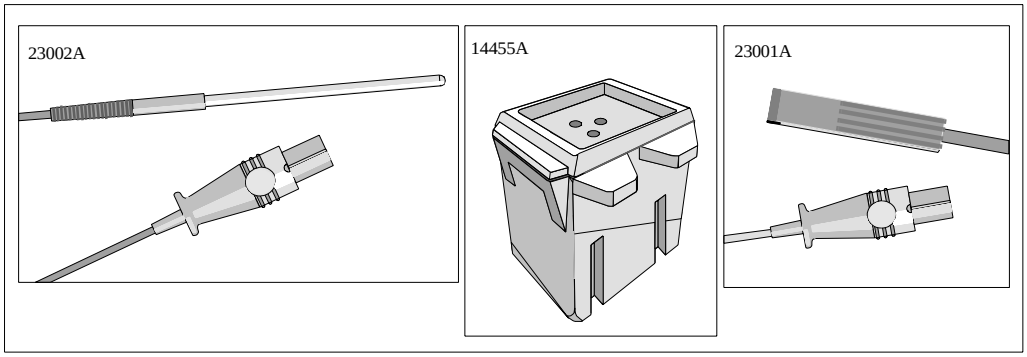


Table 6-34 Cardiac Output Temperature Probes & Accessories

Part Number	Description	Used with	
		Right Heart method	Transpul monary method[a]
14454A	IV pole mount	x	x
14455A	Ice bucket for Cardiac Output; styrofoam	x	x
15244A	Hand switch	x	x
23001A	Reusable Injectate Temp. Probe for Baxter C.O. Set 2.4m	x	x
23001B	Reusable Injectate Temp. Probe for Baxter C.O. Set 0.5m	x	x
M1646A	Reusable Injectate Temp. Probe for Pulsion Set		x
23002A	Ice bath reusable static temp.probe	x	
M1642A	Cardiac Output cable, 2.7m + 0.2m	x	
M1643A	Enhanced Cardiac Output interface cable, 2.4m + 2.4m	x	x

a. only available with Option C10

Table 6-35 General Cardiac Output Accessories

Part Number	Description
M1012-61601	Cardiac Output Service Tool to check proper function of M1012A, M1042A, M1043A

CO_2 Module Accessories

The following accessories can be ordered for the CO_2 Module:

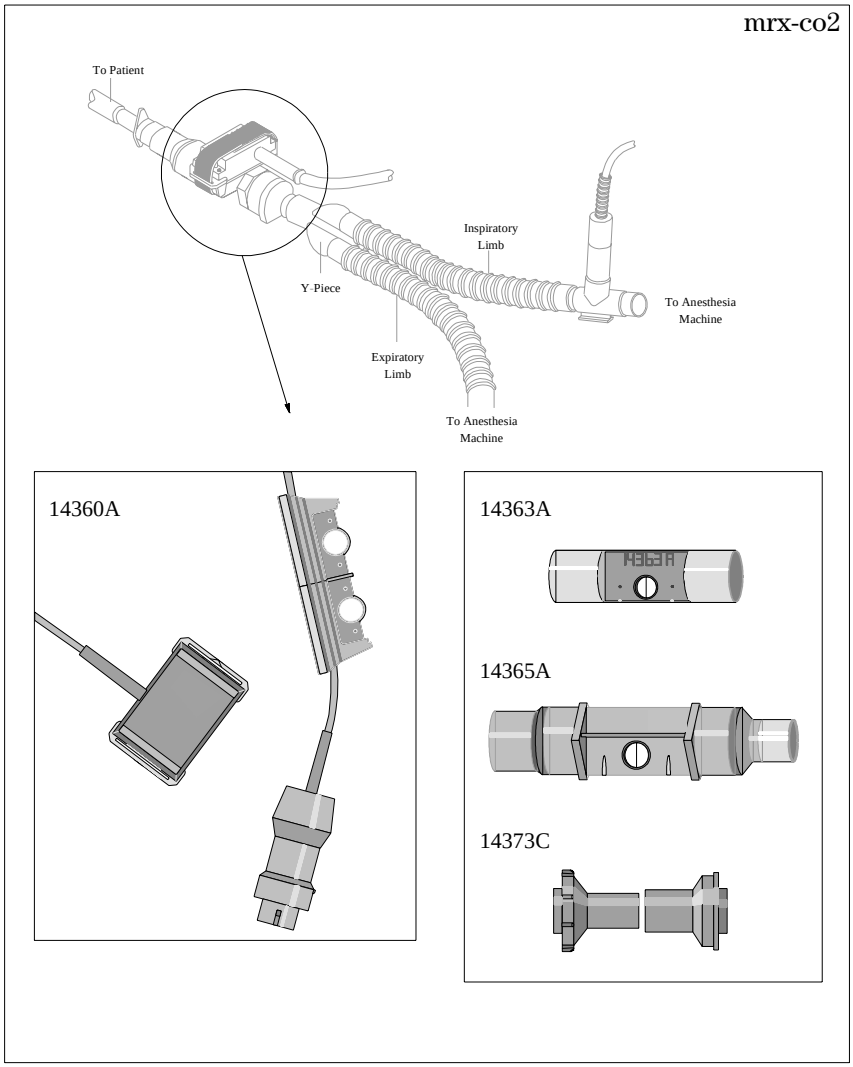


Table 6-36 CO_2 Gas Monitoring Accessories

New Part Number	Description
14360A	Airway CO_2 transducer with calstick (obsolete)
M1460A	Airway CO_2 transducer with calstick
14363A	Reusable pediatric airway adapter
14365A	Reusable adult airway adapter
14373B	Disposable 15mm airway tubing couplers (IEC)
14373C	Disposable 15mm airway tubing couplers (Non-IEC)

Sidestream CO_2 Module Accessories

The following accessories can be ordered for the Sidestream CO_2 Module:

Table 6-37 Sidestream CO_2 Gas Monitoring Accessories

New Part Number	Description
13901A	Sample tube, 2.4 m Nafion
13902A	Elbow airway adaptor, 15 mm
1612AA	Straight airway adaptor
13904A	Bacterial Filter
13905A	Hybrid Sample Tube

SvO_2 Module Accessories

All SvO_2 Module accessories are available from Abbott.

Table 6-38 SvO_2 Monitoring Accessories

Abbott Part Number	Description
50131-04	Optical Module
P7110-EH	Opticath Fiber-Optic Catheters
P7110-E	
P7110-EP-H	
P7110-EP8-H	
P7110-EP8	
P7110-PZ8-H	
P575-EH10CM	
P575-EH	

FIO_2 Module Accessories

The following accessories can be ordered for the FIO_2 Module:

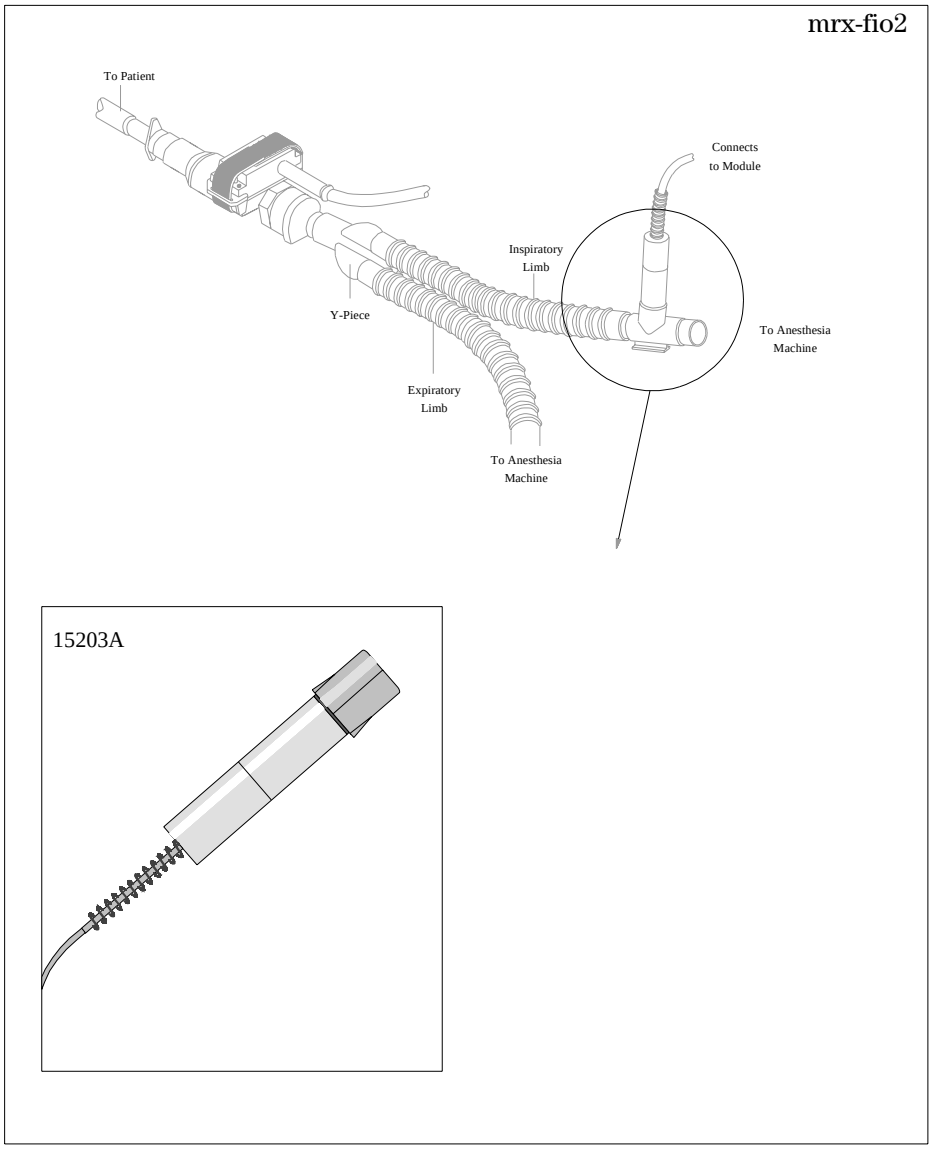


Table 6-39 FIO_2 Gas Monitoring Accessories

New Part Number	Description
15203A	Inspired air oxygen transducer

SpO_2 Module Accessories

The following accessories can be ordered for the SpO_2 Module:

Table 6-40 SpO_2 Monitoring Accessories

New Part Number	Description
M1190A	Adult SpO_2 transducer, no adapter cable required.
M1191A	Adult SpO_2 transducer, requires M1940 adapter cable.
M1192A	Small Adult/Pediatric SpO_2 transducer, requires M1940 adapter cable.
M1193A	Neonatal SpO_2 transducer, requires M1940 adapter cable.
M1194A	Adult/Pedi SpO_2 transducer, requires M1940 adapter cable.
M1195A	Infant SpO_2 transducer, requires M1940 adapter cable.
M1904A	Disposable NELLCOR® OxisensorII™ adult digit sensor, sterile.
M1903A	Disposable NELLCOR® OxisensorII™ pediatric digit sensor, sterile.
M1902A	Disposable NELLCOR® OxisensorII™ infant digit sensor, sterile.
M1901A	Disposable NELLCOR® OxisensorII™ neonatal foot sensor, sterile.
M1907A	Semi-disposable NELLCOR® Oxiband adult/neonatal sensor, non-sterile
M1906A	Semi-disposable NELLCOR® Oxiband pediatric/infant sensor, non-sterile
M1940A	Adapter cable for use with HP/Agilent/Philips Transducers.
M1900B	Adapter cable for use with NELLCOR® Transducers.

Temperature Module Accessories

The following accessories can be ordered for the Temperature Module:

Table 6-41 Temperature Probes - Disposable

New Part Number	Description
21082A	Extension cable for disposable temp. probes, 3m
21082B	Extension cable for disposable temp. probes, 1.5m
21090A	Disposable general purpose temp. probe
21091A	Disposable skin surface temp. probe
21093A	Disposable esophageal/stethoscope temp. probe, 12fr
21094A	Disposable esophageal/stethoscope temp. probe, 18fr
21095A	Disposable esophageal/stethoscope temp. probe, 24fr
21096A	Disposable Foley Catheter temp. probe, 16fr
21097A	Disposable Foley Catheter temp. probe, 18fr

Table 6-42 Temperature Probes - Reusable

New Part Number	Description
21075A	General purpose temp. probe; reusable
21075B	General purpose temp. probe; reusable (Germany)
21076A	Small flexible temp. probe; reusable
21076B	Small flexible temp. probe; reusable (Germany)
21078A	Skin surface temp. probe; tape-on; reusable
21078B	Skin surface temp. probe; tape-on; reusable (Germany)

$tcpO_2/tcpCO_2$ Module Accessories

The following accessories can be ordered for the $tcpO_2/tcpCO_2$ Module:

Table 6-43 $tcpO_2/tcpCO_2$ Monitoring Accessories

New Part Number	Description
M15209-60010	Accessory Kit
M15210-60010	CAL 1 gas (6 bottles - U.S.A. only)
M15210-64010	CAL 1 gas (6 bottles)
M15210-60020	CAL 2 gas (6 bottles - U.S.A. only) Contains: 0% O_2, 10% CO_2
M15210-64020	CAL 2 gas (6 bottles) Contains: 0% O_2, 10% CO_2
M1918A	$tcpO_2/CO_2$ Transducer
M2205A	Calibration Tubing (5x)

Thermal Array Recorder Module Accessories

The following accessories can be ordered for the Recorder Module:

Table 6-44 Thermal Array Recorder Accessories

New Part Number	Description
40477A	10 ROLLS THERMAL RECORDER PAPER
40477B	80 ROLLS THERMAL RECORDER PAPER

Blood Analysis Module Accessories

The following accessories can be ordered for the Blood Analysis Module.

Table 6-45 Blood Analysis Cartridges

Part Number	Description
order from Abbott	EG7+ Cartridge
order from Abbott	EG6+ Cartridge
order from Abbott	G3+ Cartridge
order from Abbott	EC8+ Cartridge
order from Abbott	6+ Cartridge
order from Abbott	EC6+ Cartridge
order from Abbott	EC4+ Cartridge
order from Abbott	G Cartridge
order from Abbott	E3+
order from Abbott	Creatinine Cartridge
order from Abbott	CG4+ Cartridge

Table 6-46 Blood Analysis Accessories

Part Number	Description
order from Abbott	Level 1 Control
order from Abbott	Level 3 Control

Table 6-46 Blood Analysis Accessories *(Continued)*

Part Number	Description
M3630A	Calibration Verification Set
M3636A	Capillary Tubes (65 µl)
M3634A	Electronic Simulator
M3663A	PC to RS232 Adapter cable for upgrading modules using IBM-compatible PC

EEG Module Accessories

The following accessories can be ordered for the EEG Module.

Table 6-47 EEG Module Accessories

Part Number	Description
M2268A	EEG 2.7 m trunk cable
M2269A	EEG 1.0 m trunk cable
M1931A	Reusable 80-cm-long 5-lead cables with 10-mm silver/silverchloride leadwired cup electrodes (adult)
M1932A	Reusable 80-cm-long 5-lead cables with 6-mm silver/silverchloride leadwired cup electrodes (Pediatric/Neonatal)
M1934A	Reusable 80-cm-long 5-lead cables with miniclip connectors
M1935A	Disposable, gel electrodes (50)
M2271A	Skin preparation paste
M2272A	Conductive paste
M1027-88000	EEG Test Device

VueLink Test Module Parts

The VueLink Test Module is a plug-in module used to test M1032A VueLink Modules. The following parts can be ordered.

Table 6-48 VueLink Test Module Parts

Part Number	Description
M1186-60510	VueLink Test Module
M1032-61661	Cable

Appendix A Product Information

CMS Release E Beta

	Option A54 Option A64	Option A56 Option A66	Option A68
Display Module			
Mono / Color	Mono (Option A54) Color (Option A64)	Mono (OptionA56) Color (Option A66)	Color
Number of Channels	4	6	8
Supported Remote Displays	3	3	3
Plug-in Modules			
Maximum Number of Parameter Modules	8	12	16
Supported Modules			
M1001A/B ECG (1)	1	1	1
M1002A/B ECG/RESP (1)	1	1	1
M1006A/B Invasive Pressure	3	5	6
M1008A/B NBP	1	1	1
M1012A Cardiac Output	1	1	1
M1015A Sidestream CO2	1	1	1
M1016A CO2	1	1	1
M1017A FiO2	1	1	1
M1018A tcpO2/tcpCO2	1	1	1
M1020A SpO2/Pleth	1	1	1
M1021A SvO2	1	1	1
M1029A Temperature	2 (1 Delta Temp.)	4 (2 Delta Temp.)	4 (2 Delta Temp.)
M1032A VueLink Type A	2	2	3
M1032A VueLink Type B	1	2	2
M1116A/B Recorder Module	1	1	1
M1235A Data Transfer Module	1	1	1
Patient Data Management (Standard)			
Data Storage			
1 min. resolution	16 parameters / 24 hours	16 parameters / 24 hours	32 parameters / 24 hours (16 parameters / 48 hours)
12 sec. resolution	16 parameters / 4 hours	16 parameters / 4 hours	32 parameters / 4 hours (16 parameters / 9 hours)
Trends	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation
Software Applications			
Extended Data Management	—	Option C03	Standard
1 min. resolution		32 parameters / 24 hours (16 parameters / 48 hours)	
12 sec. resolution		32 parameters / 4 hours (16 parameters / 9 hours)	
Drug Calculator	Option C05	Option C05	Standard
ST Segment Analysis	Option C10	Option C10	Standard

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.

CMS Release E Beta

	Option A54 Option A64	Option A56 Option A66	Option A68
Interfacing and Networking Capabilities			
8-Channel Analog Interface	—	Option J11	Option J11
Philips Network Interface (Standard in US)	Option J12	Option J12	Option J12
1st RS232 Interface	Option J13	Option J13	Option J13
2nd RS232 Interface	—	—	Option J13
Digital Recorder Interface	Option J14	Option J14	Option J14
1st additional Display Interface	—	Option J15 (color) or Option J16 (mono)	Option J15 (color) or Option J16 (mono)
2nd additional Display Interface	—	—	Option J16 (mono)(1)
Peripherals			
Remote Keypad (Standard US)	M1106C	M1106C	M1106C
4 Channel Recorder	M1117A	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A	M1276A
14 Inch Monochrome Display	—	M1092A (Option A03)	M1092A (Option A03)
14 Inch Color Display	—	M1094B (Option A03)	M1094B (Option A03)
21 Inch Color Display	—	M1234B	M1234B
Substitute Options			
Substitute 8-slot Satellite Rack for Integral Rack	Option H50	Option H50	Option H50
Substitute 6-slot Satellite Rack for Integral Rack	Option H52	Option H52	Option H52
Substitute Classic HIF for Standard HIF(2)	Option H60	Option H60	Option H60
Substitute short System Cable	Option K01	Option K01	Option K01
Substitute 3 meter System Cable	Option K02	Option K02	Option K02
Substitute 1.5 meter System Cable	Option K03	Option K03	Option K03
Substitute 0.75 meter System Cable	Option K04	Option K04	Option K04

(1) A 2nd independent monochrome display controller (option J16) and the 8-channel analog interface are not supported simultaneously.
(2) The M1106B Handheld keypad must be ordered separately.

ACMS Release E Beta

	Option A74 Option A84	Option A76 Option A86	Option A88
Display Module			
Mono / Color	Mono (Option A74) Color (Option A84)	Mono (Option A76) Color (Option A86)	Color
Number of Channels	4	6	8
Supported Remote Displays	3	3	3
Plug-in Modules			
Max. Number of Parameter Modules	8	12	16
Supported Modules			
M1001A/B ECG (1)	1	1	1
M1002A/B ECG/RESP (1)	1	1	1
M1006A/B Invasive Pressure	3	5	6
M1008A/B NBP	1	1	1
M1012A Cardiac Output	1	1	1
M1015A Sidestream CO_2	1	1	1
M1016A CO_2	1	1	1
M1017A FiO_2	1	1	1
M1020A SpO_2/Pleth	1	1	1
M1021A SvO_2	1	1	1
M1029A Temperature	2 (1 Delta Temp.)	4 (2 Delta Temp.)	4 (2 Delta Temp.)
M1032A VueLink Type A	1 (2 with Option C24)	1 (2 with Option C25)	3
M1032A VueLink Type B(2)	1	1 (2 with Option C25)	2
M1116A/B Recorder Module	1	1	1
M1235A Data Transfer Module	1	1	1
Anesthesia Gas Monitoring			
M1026A Anesthetic Gas Module	1	1	1
Patient Data Management			
Data Storage			
1 min. resolution	16 parameters / 24 hours	16 parameters / 24 hours	32 parameters / 24 hours (16 parameters / 48 hours)
12 sec. resolution	16 parameters / 4 hours	16 parameters / 4 hours	32 parameters / 4 hours (16 parameters / 9 hours)
Trends	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation
Software Applications			
Extended Data Management	—	Option C03	Standard
1 min. resolution		32 parameters / 24 hours (16 parameters / 48 hours)	
12 sec. resolution		32 parameters / 4 hours (16 parameters / 9 hours)	

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) The ACMS does not support VueLink Option #A02.

	Option A74 Option A84	Option A76 Option A86	Option A88
Drug Calculator	Option C05	Option C05	Standard
ST Segment Analysis	Standard	Standard	Standard
Interface Accelerator	Option C24 • Supports 1 additional VueLink Module (Type A) • Supports Philips Network capability	Option C25 • Supports independent display controller • Supports 2 additional VueLink Modules (Type A, Type B) • Supports Philips Network capability	Standard
Interfacing and Networking Capabilities			
8-Channel Analog Interface	—	Option J11	Option J11(1)
Philips Network Interface	Option J12 with Option C24	Option J12 with Option C25	Option J12
1st RS232 Dual Interface(2)	Standard	Standard	Standard
2nd RS232 Dual Interface	Option J13	Option J13	Option J13
Delete 1st RS232 Dual Interface(2)	Option D13	Option D13	Option D13
Digital Recorder Interface	Option J14	Option J14	Option J14
1st additional Display Interface	—	Option J15 (color) or Option J16 (mono) both with Option C25	Option J15 (color) or Option J16 (mono)
2nd additional Display Interface	—	—	Option J16 (mono) (1)
Peripherals			
Remote Keypad (Standard US)	M1106C	M1106C	M1106C
4 Channel Recorder	M1117A	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A	M1276A
14 Inch Monochrome Display	—	M1092A (Option A03)	M1092A (Option A03)
14 Inch Color Display	—	M1094B (Option A03)	M1094B (Option A03)
21 Inch Color Display	—	M1234B	M1234B
Substitute Options			
Substitute 8-slot Satellite Rack for Integral Rack	Option H50	Option H50	Option H50
Substitute 6-slot Satellite Rack for Integral Rack	Option H52	Option H52	Option H52
Substitute short System Cable	Option K01	Option K01	Option K01
Substitute 3.0 meter System Cable	Option K02	Option K02	Option K02
Substitute 1.5 meter System Cable	Option K03	Option K03	Option K03
Substitute 0.75 meter System Cable	Option K04	Option K04	Option K04

(1) A 2nd independent monochrome display controller (option J16) and an 8-channel analog interface are not supported simultaneously.

(2) Includes a 3.0 meter RS232 cable.

CMS Release F

	M1175A Option A54 M1176A Option A64	M1175A Option A56 M1176A Option A66	M1176A Option A68
Display Module			
Mono / Color	Mono (Option A54) Color (Option A64)	Mono (Option A56) Color (Option A66)	Color
Number of Channels	4	6	8
Supported Remote Displays	3	3	3
Plug-in Modules			
Maximum Number of Parameter Modules	8	12	16
Supported Modules			
M1001A/B ECG (1)	1	1	1
M1002A/B ECG/RESP (1)	1	1	1
M1006A/B Invasive Pressure	3	5	6
M1008A/B NBP	1	1	1
M1012A Cardiac Output	1	1	1
M1015A Sidestream CO2(2)	1	1	1
M1016A CO2	1	1	1
M1017A FIO2	1	1	1
M1018A tcpO2/tcpCO2	1	1	1
M1020A SpO2/Pleth	1	1	1
M1021A SvO2	1	1	1
M1029A Temperature	2 (1 Delta Temp.)	4 (2 Delta Temp.)	4 (2 Delta Temp.)
M1032A VueLink Type A	2	2	3
M1032A VueLink Type B	1	2	2
M1116A/B Recorder Module	1	1	1
M1235A Data Transfer Module	1	1	1
Patient Data Management (Standard)			
Data Storage			
1 min. resolution	16 parameters / 24 hours	16 parameters / 24 hours	32 parameters / 24 hours (16 parameters / 48 hours)
12 sec. resolution	16 parameters / 4 hours	16 parameters / 4 hours	32 parameters / 4 hours (16 parameters / 9 hours)
Trends	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation
Software Applications			
Extended Data Management	—	Option C03	Standard
1 min. resolution		32 parameters / 24 hours (16 parameters / 48 hours)	
12 sec. resolution		32 parameters / 4 hours (16 parameters / 9 hours)	
Drug Calculator	Option C05	Option C05	Standard
ST Segment Analysis	Option C10	Option C10	Standard

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) Pending FDA clearance.

CMS Release F

	M1175A Option A54 M1176A Option A64	M1175A Option A56 M1176A Option A66	M1176A Option A68
Interfacing and Networking Capabilities			
8-Channel Analog Interface	—	Option J11	Option J11
Philips Network Interface	Standard	Standard	Standard
1st RS232 Interface	Option J13	Option J13	Option J13
2nd RS232 Interface	—	----	Option J13
Digital Recorder Interface	Option J14	Option J14	Option J14
1st additional Display Interface	—	Option J15 (color) or Option J16 (mono)	Option J15 (color) or Option J16 (mono)
2nd additional Display Interface	—	—	Option J16 (mono)(1)
1st additional Flatscreen Display Interface	—	Option J25 (M1095A)	Option J25 (M1095A)
Peripherals			
Remote Keypad	Standard	Standard	Standard
4 Channel Recorder	M1117A	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A	M1276A
14 Inch Monochrome Display	—	M1092A (Option A03)	M1092A (Option A03)
14 Inch Color Display	—	M1094B (Option A03)	M1094B (Option A03)
10.4 Inch Flatscreen Color Display	—	M1095A (Option A03)	M1095A (Option A03)
21 Inch Color Display(2)	—	M1175/6A (Option H71)	M1175/6A (Option H71)
Substitute Options			
Substitute Flatscreen Display	—	Option H01	Option H01
Substitute 8-slot Satellite Rack for Integral Rack	Option H50	Option H50	Option H50
Substitute 6-slot Satellite Rack for Integral Rack	Option H52	Option H52	Option H52
Substitute Classic HIF for Standard HIF	Option H60	Option H60	Option H60
Substitute short System Cable	Option K01	Option K01	Option K01
Substitute 3 meter System Cable	Option K02	Option K02	Option K02
Substitute 1.5 meter System Cable	Option K03	Option K03	Option K03

(1) A 2nd independent monochrome display controller (option J16) and the 8-channel analog interface are not supported simultaneously.
(2) Includes isolation transformer.

ACMS Release F

	M1175A Option A74 M1176A Option A84	M1175A Option A76 M1176A Option A86	M1176A Option A88
Display Module			
Mono / Color	Mono A74 / Color A84	Mono A76 / Color A86	Color
Number of Channels	4	6	8
Supported Remote Displays	3	3	3
Plug-in Modules			
Max. Number of Parameter Modules	8	12	16
Supported Modules			
M1001A/B ECG (1)	1	1	1
M1002A/B ECG/RESP (1)	1	1	1
M1006A/B Invasive Pressure	3	5	6
M1008A/B NBP	1	1	1
M1012A Cardiac Output	1	1	1
M1015A Sidestream CO_2	1	1	1
M1016A CO_2	1	1	1
M1017A FIO_2	1	1	1
M1020A SpO_2/Pleth	1	1	1 (2 with Option C11)
M1021A SvO_2	1	1	1
M1029A Temperature	2 (1 Delta Temp.)	4 (2 Delta Temp.)	4 (2 Delta Temp.)
M1032A VueLink Type A	1 (2 with Option C24)	1 (2 with Option C25)	3
M1032A VueLink Type B	1	1 (2 with Option C25)	2
M1116A/B Recorder Module	1	1	1
M1235A Data Transfer Module	1	1	1
Anesthesia Gas Monitoring			
M1026A Anesthetic Gas Module	1	1	1
Patient Data Management			
Data Storage 1 min. resolution 12 sec. resolution	 16 parameters / 24 hours 16 parameters / 4 hours	 16 parameters / 24 hours 16 parameters / 4 hours	 32 parameters / 24 hours (16 parameters / 48 hours) 32 parameters / 4 hours (16 parameters / 9 hours)
Trends	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation
Software Applications			
Extended Data Management	—	Option C03	Standard
1 min. resolution		32 parameters / 24 hours (16 parameters / 48 hours)	
12 sec. resolution		32 parameters / 4 hours (16 parameters / 9 hours)	
Drug Calculator	Option C05	Option C05	Standard
Dual SpO_2	—	—	Option C11
(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.			
ST Segment Analysis	Standard	Standard	Standard

ACMS Release F

	M1175A Option A74 M1176A Option A84	M1175A Option A76 M1176A Option A86	M1176A Option A88
Interface Accelerator	Option C24 • Supports 1 additional VueLink Module (Type A) • Supports Philips Network capability	Option C25 • Supports independent display controller • Supports 2 additional VueLink Modules (Type A, Type B) • Supports Philips Network capability	Standard
Interfacing and Networking Capabilities			
8-Channel Analog Interface	—	Option J11	Option J11 (1)
Philips Network Interface	Option J12 with Option C24	Option J12 with Option C25	Option J12
1st RS232 Dual Interface (2)	Standard	Standard	Standard
2nd Dual RS232 Dual Interface	Option J13	Option J13	Option J13
Delete 1st RS232 Dual Interface	Option D13	Option D13	Option D13
Digital Recorder Interface	Option J14	Option J14	Option J14
1st additional Display Interface	—	Option J15 (color) or Option J16 (mono) both with Option C25	Option J15 (color) or Option J16 (mono)
2nd additional Display Interface	—	—	Option J16 (mono) (1)
1st additional Flatscreen Display Interface	—	Option J25 (M1095A)with Option C25	Option J25 (M1095A)
Peripherals			
Handheld Keypad	Standard	Standard	Standard
4 Channel Recorder	M1117A	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A	M1276A
14 Inch Monochrome Display	—	M1092A (Option A03)	M1092A (Option A03)
14 Inch Color Display	—	M1094B (Option A03)	M1094B (Option A03)
10.4 Inch Flatscreen Color Display	—	M1095A (Option A03)	M1095A (Option A03)
21 Inch Color Display (3)	—	M1175/6A (Option H71)	M1175/6A (Option H71)
Substitute Options			
Substitute Flatscreen display	—	Option H01	Option H01
Substitute 8-slot Satellite Rack for Integral Rack	Option H50	Option H50	Option H50
Substitute 6-slot Satellite Rack for Integral Rack	Option H52	Option H52	Option H52
Substitute 3 meter System Cable	Option K02	Option K02	Option K02
Substitute 1.5 meter System Cable	Option K03	Option K03	Option K03

(1) A 2nd Independent Monochrome Display Controller (Option J16) and an 8-channel Analog interface are not supported simultaneously.
(2) Includes a 3.0 meter (9.8 ft.) RS232 cable.
(3) Includes Isolation Transformer.

NCMS Release F

	M1175A Option A36 M1176A Option A46	M1176A Option A48
Display Module		
Mono / Color	Mono (Option A36) Color (Option A46)	Color
Number of Channels	6	8
Plug-in Modules		
Maximum Number of Parameter Modules	12	16
Supported Modules		
M1001A/B ECG [1]	1	1
M1002A/B ECG/RESP [1]	1	1
M1006A/B Invasive Pressure	3	4
M1008A/B NBP	1	1
M1012A Cardiac Output	1	1
M1015A Sidestream CO2[2]	1	1
M1016A CO2	1	1
M1017A FIO2	1	1
M1018A tcpO2/tcpCO2	1	1
M1020A SpO2/Pleth	2	2
M1021A SvO2	1	1
M1029A Temperature	4 (2 Delta Temp.)	4 (2 Delta Temp.)
M1032A VueLink Type A	2	3
M1032A VueLink Type B	2	2
M1116A/B Recorder Module	1	1
M1235A Data Transfer Module	1	1
Patient Data Management (Standard)		
Data Storage		
1 min. resolution	16 parameters / 24 hours	32 parameters / 24 hours (16 parameters / 48 hours)
12 sec. resolution	16 parameters / 4 hours	32 parameters / 4 hours (16 parameters / 9 hours)
Trends	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation
Software Applications		
Drug Calculator	Standard	Standard
ST Segment Analysis	Option C10	Standard

[1] M1001A/B and M1002A/B cannot be used simultaneously in a system.
[2] Pending FDA clearance.

NCMS Release F

	M1175A Option A36 M1176A Option A46	M1176A Option A48
Interfacing and Networking Capabilities		
8-Channel Analog Interface	Option J11	Option J11
Philips Network Interface	Standard	Standard
1st RS232 Interface	Option J13	Option J13
2nd RS232 Interface	-----	Option J13
Digital Recorder Interface	Option J14	Option J14
Peripherals		
Remote Keypad	Standard	Standard
4 Channel Recorder	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A
Substitute Options		
Substitute Flatscreen Display	Option H01	Option H01
Substitute 8-slot Satellite Rack for Integral Rack	Option H50	Option H50
Substitute 6-slot Satellite Rack for Integral Rack	Option H52	Option H52
Substitute short System Cable	Option K01	Option K01
Substitute 3 meter System Cable	Option K02	Option K02
Substitute 1.5 meter System Cable	Option K03	Option K03

CMS Release G

	M1175A Option A54 M1176A Option A64 M1177A Option A64	M1175A Option A56 M1176A Option A66 M1177A Option A66	M1176A Option A68 M1177A Option A67
Display Module			
Mono / Color	Mono (Option A54) Color (Option A64)	Mono (OptionA56) Color (Option A66)	Color
Number of Channels	4	6	8
Supported Remote Displays (CRT)	3	3	3
Plug-in Modules			
Maximum Number of Parameter Modules	8	12	16
Supported Modules			
M1001A/B ECG (A)	1	1	1
M1002A/B ECG/RESP (A)	1	1	1
M1002A ECG/RESP with Analog Respiration Output (A) (B)	1 (with Option C01)	1 (with Option C01)	1 (with Option C01)
M1006A/B Invasive Pressure	3	5	6
M1006A/B Invasive Pressure with Analog Pressure Output	3 (with Option C01)	5 (with Option C01)	6 (with Option C01)
M1008A/B NBP (B)	1	1	1
M1012A Cardiac Output	1	1	1
M1015A Sidestream CO2	1	1	1
M1016A CO2	1	1	1
M1017A FIO2	1	1	1
M1018A tcpO2/tcpCO2 (B)	1	1	1
M1020A SpO2/Pleth	1	1	1
M1021A SvO2	1	1	1
M1022A Blood Analysis (B)	1	1	1
M1029A Temperature	2 (1 Delta Temp.)	4 (2 Delta Temp.)	4 (2 Delta Temp.)
M1032A VueLink Type A	2	2	3
M1032A VueLink Type B	1	2	2
M1116A/B Recorder Module (B)	1	1	1
M1235A Data Transfer Module	1	1	1
Patient Data Management (Standard)			
Data Storage			
1 min. resolution	16 parameters / 24 hours	16 parameters / 24 hours	32 parameters / 24 hours (16 parameters / 48 hours)
12 sec. resolution	16 parameters / 4 hours	16 parameters / 4 hours	32 parameters / 4 hours (16 parameters / 9 hours)
Trends	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation
Software Applications			
Extended Data Management	—	Option C03	Standard
1 min. resolution		32 parameters / 24 hours (16 parameters / 48 hours)	
12 sec. resolution		32 parameters / 4 hours (16 parameters / 9 hours)	
Drug Calculator	Standard	Standard	Standard
ST Segment Analysis	Option C10	Option C10	Standard

CMS Release G

	M1175A Option A54 M1176A Option A64 M1177A Option A64	M1175A Option A56 M1176A Option A66 M1177A Option A66	M1176A Option A68 M1177A Option A67
Interfacing and Networking Capabilities			
8-Channel Analog Interface	—	Option J11	Option J11
Philips Network Interface	Standard	Standard	Standard
1st RS232 Interface	Option J13	Option J13	Option J13
2nd RS232 Interface	—	----	Option J13
Digital Recorder Interface	Option J14	Option J14	Option J14
1st additional Display or Flatscreen Interface	—	Option J15 (color) or Option J16 (mono) or Option J25 (Flatscreen)	Option J15 (color) or Option J16 (mono) or Option J25 (Flatscreen)
Peripherals			
Remote Keypad	Standard	Standard	Standard
4 Channel Recorder	M1117A	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A	M1276A
14 Inch Monochrome Display	—	M1092A (Option A03)	M1092A (Option A03)
14 Inch Color Display	—	M1094B (Option A03)	M1094B (Option A03)
10.4 Inch Flatscreen Color Display	—	M1095A (Option A03)	M1095A (Option A03)
21 Inch Color Display(1)	—	M1175/6A (Option H71)	M1175/6A (Option H71)
Substitute Options			
Substitute Flatscreen display (Japan only) (2) (3)	Option H01	Option H01	Option H01
Substitute 8-slot Satellite Rack for Integral Rack (3)	Option H50	Option H50	Option H50
Substitute 6-slot Satellite Rack for Integral Rack (3)	Option H52	Option H52	Option H52
Substitute 6-slot Satellite Rack for 8-slot Satellite Rack *(M1177A only)*	Option H53	Option H53	Option H53
Substitute 3 meter System Cable (3)	Option K02	Option K02	Option K02
Substitute 1.5 meter System Cable (3)	Option K03	Option K03	Option K03

(A) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(B) Each module requires 2 slots in the integral and/or Satellite Rack.
(1) Includes isolation transformer.
(2) Not available with Model M1175A.
(3) Not available with Model M1177A.

ACMS Release G

	M1175A Option A74 M1176A Option A84	M1175A Option A76 M1176A Option A86 M1177A Option A86	M1176A Option A88 M1177A Option A88
Display Module			
Mono / Color	Mono A74 / Color A84	Mono A76 / Color A86	Color
Number of Channels	4	6	8
Supported Remote Displays (CRT)	3	3	3
Plug-in Modules			
Max. Number of Parameter Modules	8	12	16
Supported Modules			
M1001A/B ECG (1)	1	1	1
M1002A/B ECG/RESP (1)	1	1	1
M1002A ECG/RESP with Analog Respiration Output (1) (2)	1 (with Option C01)	1 (with Option C01)	1 (with Option C01)
M1006A/B Invasive Pressure	3	5	6 (5 with Option C11)
M1006A/B Invasive Pressure with Analog Pressure Output	3 (with Option C01)	5 (with Option C01)	5 (with Option C01)
M1008A/B NBP (2)	1	1	1
M1012A Cardiac Output	1	1	1
M1015A Sidestream CO_2	1	1	1
M1016A CO_2	1	1	1
M1017A FIO_2	1	1	1
M1018A $tcpO_2$/$tcpCO_2$ (2)	—	1 (with Option C25)	1
M1020A SpO_2/Pleth	1	1	1 (2 with Option C11)
M1021A SvO_2	1	1	1
M1022A Blood Analysis (2)	1	1	1
M1029A Temperature	2 (1 Delta Temp.)	4 (2 Delta Temp.)	4 (2 Delta Temp.)
M1032A VueLink Type A	2	1 (2 with Option C25)	2 (1 with Option C11)
M1032A VueLink Type B	1	1 (2 with Option C25)	2
M1116A/B Recorder Module (2)	1	1	1
M1235A Data Transfer Module	1	1	1
Anesthesia Gas Monitoring			
M1026A Anesthetic Gas Module	1	1	1
Anesthesia Machine Ventilators			
Ohmeda 7800/7810	1	1	1
Patient Data Management			
Data Storage 1 min. resolution 12 sec. resolution	 16 parameters / 24 hours 16 parameters / 4 hours	 16 parameters / 24 hours 16 parameters / 4 hours	 32 parameters / 24 hours (16 parameters / 48 hours) 32 parameters / 4 hours (16 parameters / 9 hours)
Trends	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) Each module requires 2 slots in the integral and/or Satellite Rack.

Software Applications			
Extended Data Management	—	Option C03	Standard
1 min. resolution 12 sec. resolution		32 parameters / 24 hours (16 parameters / 48 hours) 32 parameters / 4 hours (16 parameters / 9 hours)	

ACMS Release G

	M1175A Option A74 M1176A Option A84	M1175A Option A76 M1176A Option A86 M1177A Option A86	M1176A Option A88 M1177A Option A88
Drug Calculator	Standard	Standard	Standard
Dual SpO_2	—	—	Option C11
ST Segment Analysis	Standard	Standard	Standard
Interface Accelerator	Option C24 Supports Philips Network capability.	Option C25 Supports a 2nd independent display, tcgas measurement, 2nd Vuelink type A&B module and Philips Network capability	Standard
Interfacing and Networking Capabilities			
8-Channel Analog Interface	—	Option J11	Option J11 *(1)*
Philips Network Interface	Option J12 with Option C24	Option J12 with Option C25	Option J12
1st RS232 Dual Interface *(3)*	Standard	Standard	Standard
2nd RS232 Dual Interface	Option J13	Option J13	Option J13
Delete 1st RS232 Dual Interface	Option D13	Option D13	Option D13
Digital Recorder Interface	Option J14	Option J14	Option J14
1st additional independent Display or Flatscreen Interface	—	Option J15 (color) or Option J16 (mono) or Option J25 (Flatscreen) (only with Option C25)	Option J15 (color) or Option J16 (mono) or Option J25 (Flatscreen)
2nd additional independent Display or Flatscreen Interface *(2)*	—	—	Option J16 (mono) or Option J15 (color) or Option J25 (Flatscreen)) *(1)*
Peripherals			
Handheld Keypad	Standard	Standard	Standard
4 Channel Recorder	M1117A	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A	M1276A
14 Inch Monochrome Display	—	M1092A (Option A03)	M1092A (Option A03)
14 Inch Color Display	—	M1094B (Option A03)	M1094B (Option A03)
10.4 Inch Flatscreen Color Display	—	M1095A (Option A03)	M1095A (Option A03)
21 Inch Color Display *(4)*	—	M1175/6A (Option H71)	M1175/6A (Option H71)

Substitute Options			
Substitute Flatscreen display (Japan only) (5) (6)	Option H01	Option H01	Option H01
Substitute 8-slot Satellite Rack for Integral Rack *(6)*	Option H50	Option H50	Option H50
Substitute 6-slot Satellite Rack for Integral Rack *(6)*	Option H52	Option H52	Option H52
Substitute 6-slot Satellite Rack for 8-slot Satellite Rack *(M1177A only)*	Option H53	Option H53	Option H53
Substitute 3 meter System Cable *(6)*	Option K02	Option K02	Option K02
Substitute 1.5 meter System Cable *(6)*	Option K03	Option K03	Option K03

(1) A 2nd Independent Display Controller and an 8-channel Analog interface are not supported simultaneously.
(2) The 2nd additional Display can only be a Flatscreen if the 1st additional Display is a CRT.
(3) Includes a 3.0 meter (9.8 ft.) RS232 cable.
(4) Includes Isolation Transformer.
(5) Not available with Model M1175A Option A74 and A76.

NCMS Release G

	M1175A Option A36 M1176A Option A46 M1177A Option A46	M1176A Option A48 M1177A Option A48
Display Module		
Mono / Color	Mono (Option A36) Color (Option A46)	Color
Number of Channels	6	8
Plug-in Modules		
Maximum Number of Parameter Modules	12	16
Supported Modules		
M1001A/B ECG (1)	1	1
M1002A/B ECG/RESP (1)	1	1
M1002A ECG/RESP with Analog Respiration Output (1) (2)	1 (with Option C01)	1 (with Option C01)
M1006A/B Invasive Pressure	3	4
M1006A/B Invasive Pressure with Analog Pressure Output	3 (with Option C01)	4 (with Option C01)
M1008B NBP (2)	1	1
M1012A Cardiac Output	1	1
M1015A Sidestream CO_2	1	1
M1016A CO_2	1	1
M1017A FIO_2	1	1
M1018A $tcpO_2$/$tcpCO_2$ (2)	1	1
M1020A SpO_2/Pleth	2	2
M1021A SvO_2	1	1
M1022A Blood Analysis (2)	1	1
M1029A Temperature	4 (2 Delta Temp.)	4 (2 Delta Temp.)
M1032A VueLink Type A	2	3
M1032A VueLink Type B	2	2
M1116A/B Recorder Module (2)	1	1
M1235A Data Transfer Module	1	1
Patient Data Management (Standard)		
Data Storage		
1 min. resolution	16 parameters / 24 hours	32 parameters / 24 hours (16 parameters / 48 hours)
12 sec. resolution	16 parameters / 4 hours	32 parameters / 4 hours (16 parameters / 9 hours)
Trends	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation
Software Applications		
Drug Calculator	Standard	Standard
ST Segment Analysis	Option C10	Standard

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) Each module requires 2 slots in the integral and/or Satellite Rack.

NCMS Release G

	M1175A Option A36 M1176A Option A46 M1177A Option A46	M1176A Option A48 M1177A Option A48
Interfacing and Networking Capabilities		
8-Channel Analog Interface	Option J11	Option J11
Philips Network Interface	Standard	Standard
1st RS232 Interface	Option J13	Option J13
2nd RS232 Interface	----	Option J13
Digital Recorder Interface	Option J14	Option J14
Peripherals		
Remote Keypad	Standard	Standard
4 Channel Recorder	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A
Substitute Options		
Substitute Flatscreen display *(Japan only)* (1) (2)	Option H01	Option H01
Substitute 8-slot Satellite Rack for Integral Rack (2)	Option H50	Option H50
Substitute 6-slot Satellite Rack for Integral Rack (2)	Option H52	Option H52
Substitute 6-slot Satellite Rack for 8-slot Satellite Rack *(M1177A only)*	Option H53	Option H53
Substitute Short System Cable (2)	Option K01	Option K01
Substitute 3 meter System Cable (2)	Option K02	Option K02

(1) Not available with Model M1175A.
(2) Not available with Model M1177A.

CMS Release A.0

	M1175A (Mono)	M1176A (Color) M1177A (Color)	
	Option A56	Option A64	Option A68
Display Module			
Mono / Color	Mono	Color	Color
Number of Channels	6	4	8
Supported Remote Displays	3	3	3
Plug-in Modules			
Maximum Number of Parameter Modules	8 (12 with Opt. J26)	8	12 (16 with Opt. J28)
Supported Modules			
M1001A/B ECG *(1)*	1	1	1
M1002A/B ECG/RESP *(1)*	1	1	1
M1002A ECG/RESP with Analog Respiration Output (with Opt. C01)*(1)(2)*	1	1	1
M1006A/B Invasive Pressure	3 (5 with Opt. J26)	3	5 (6 with Opt. J28)
M1006A/B Invasive Pressure with Analog Pressure Output (with Opt. C01)	3 (5 with Opt. J26)	3	5 (6 with Opt. J28)
M1008A/B NBP *(2)*	1	1	1
M1012A Cardiac Output	1	1	1
M1015A Sidestream CO_2	1	1	1
M1016A CO_2	1	1	1
M1017A FiO_2	1	1	1
M1018A $tcpO_2$/$tcpCO_2$ *(2)*	1	1	1
M1020A SpO_2/Pleth	2	2	2
M1021A SvO_2 *(2)*	1	1	1
M1022A Blood Analysis *(2)*	1	1	1
M1029A Temperature	2 (1 Delta Temp.) 4 (2 Delta Temp. with Opt. J26)	2 (1 Delta Temp.)	4 (2 Delta Temp.)
M1032A VueLink Type A	2	2	2
M1032A VueLink Type B	1 (2 with Opt. J26)	1	2
M1116A/B Recorder Module *(2)*	1	1	1
M1235A Data Transfer Module	1	1	1
Patient Data Management			
Standard Data Management			
12 sec. resolution	Standard	Standard	Standard
1 min. resolution	Standard	Standard	Standard
Extended Data Management			
12 sec. resolution	Standard with Opt. J26	—	Standard with Opt. J28
1 min. resolution	Standard with Opt. J26	—	Standard with Opt. J28
Trends	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation
Neonatal Event Review	Opt. C04	Opt. C04	Opt. C04
Respiratory Loops (for selected ventilators and Vuelink)	Opt. C80	Opt. C80	Opt. C80

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) These modules require 2 slots in the integral and/or Satellite Rack.

Software Applications			
Drug Calculator	Standard	Standard	Standard
ST Segment Analysis	Standard	Standard	Standard
Interfacing and Networking Capabilities			
8-Channel Analog Interface	Opt. J11	Opt. J11	Opt. J11

CMS Release A.0

	M1175A (Mono)	M1176A (Color) M1177A (Color)	
	Option A56	**Option A64**	**Option A68**
Philips Network Interface	Opt. J12	Opt. J12	Opt. J12
1st RS232 Interface	Opt. J13	Opt. J13	Opt. J13
2nd RS232 Interface	—	—	Opt. J13 and Opt. J28
Digital Recorder Interface	Opt. J14	Opt. J14	Opt. J14
1st additional Display or Flatscreen Interface	With Opt. J26 ==> Opt. J15 (color) or Opt. J16 (mono) or Opt. J25 (Flatscreen)	—	Opt. J15 (color) or Opt. J16 (mono) or Opt. J25 (Flatscreen)
Peripherals			
Remote Keypad	Standard	Standard	Standard
4 Channel Recorder	M1117A	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A	M1276A
14 Inch Monochrome Display	M1092A (Opt. A03)	—	M1092A (Opt. A03)
14 Inch Color Display	M1094B (Opt. A03)	—	M1094B (Opt. A03)
10.4 Inch Flatscreen Color Display	M1095A (Opt. A03)	—	M1095A (Opt. A03)
21 Inch Color Display(1)	M1165/66A (Opt. H71)	—	M1165/66A (Opt. H71)
Substitute Options			
Substitute Flatscreen display (Japan only) (2) (3)	Opt. H01	Opt. H01	Opt. H01
Substitute 8-slot Satellite Rack for Integral Rack (3)	Opt. H50	Opt. H50	Opt. H50
Substitute 6-slot Satellite Rack for Integral Rack (3)	Opt. H52	Opt. H52	Opt. H52
Substitute 6-slot Satellite Rack for 8-slot Satellite Rack *(M1177A only)*	Opt. H53	Opt. H53	Opt. H53
Substitute 3 meter System Cable (3)	Opt. K02	Opt. K02	Opt. K02
Substitute 1.5 meter System Cable (3)	Opt. K03	Opt. K03	Opt. K03

(1) Includes isolation transformer.
*(2)*Not available with Model M1175A.
*(3)*Not available with Model M1177A.

ACMS Release A.0

	M1175A (Mono) Option A76	M1176A (Color) M1177A (Color) Option A88
Display Module		
Mono / Color	Mono	Color
Number of Channels	6	8
Supported Remote Displays (CRT)	3	3
Plug-in Modules		
Max. Number of Parameter Modules	8 (12 with Opt. J26)	12 (16 with Opt. J28)
Supported Modules		
M1001A/B ECG *(1)*	1	1
M1002A/B ECG/RESP *(1)*	1	1
M1002A ECG/RESP with Analog Respiration Output (with Opt. C01) *(1) (2)*	1	1
M1006A/B Invasive Pressure	3 (5 with Opt. J26)	5 (6 with Opt. J28)
M1006A/B Invasive Pressure with Analog Pressure Output (with Opt. C01)	3 (5 with Opt. J26)	5 (6 with Opt. J28)
M1008A/B NBP *(2)*	1	1
M1012A Cardiac Output	1	1
M1015A Sidestream CO_2	1	1
M1016A CO_2	1	1
M1017A FiO_2	1	1
M1018A $tcpO_2$/$tcpCO_2$ *(2)*	1	1
M1020A SpO_2/Pleth	2	2 (1 with Opt. J28, without Opt. C11)
M1021A SvO_2 *(2)*	1	1
M1022A Blood Analysis *(2)*	1	1
M1029A Temperature	2 (1Delta Temp.) 4 (2 Delta Temp.) with Opt. J26	4 (2 Delta Temp.)
M1032A VueLink Type A	2	2 (1 with Opt. C11)
M1032A VueLink Type B	2	2
M1116A/B Recorder Module *(2)*	1	1
M1235A Data Transfer Module	1	1
Anesthesia Gas Monitoring		
M1026A Anesthetic Gas Module	1	1
Anesthesia Ventilators		
Ohmeda 7800/7810	Standard	Standard
Ohmeda 7900	Opt. C79	Opt. C79
Respiratory Loops (for selected ventilators &Vuelink)	Opt. C80	Opt. C80
Patient Data Management		
Standard Data Management		
12 second resolution	Standard	Standard
1 min. resolution	Standard	Standard
Extended Data Management		
12 second resolution	Standard with Opt. J26	Standard with Opt. J28
1 min. resolution	Standard with Opt. J26	Standard with Opt. J28
Trends	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) These modules require 2 slots in the integral and/or Satellite Rack.

ACMS Release A.0

	M1175A (Mono)	M1176A (Color) M1177A (Color)
	Option A76	**Option A88**
Software Applications		
Drug Calculator	Standard	Standard
Dual SpO_2	Standard	With Opt. J28 you need Opt. C11
ST Segment Analysis	Standard	Standard
Interfacing and Networking Capabilities		
8-Channel Analog Interface *(1)*	Standard	Standard
Philips Network Interface	Standard	Standard
1st RS232 Dual Interface *(2)*	Standard	Standard
2nd RS232 Dual Interface	Opt. J13	Opt. J13
Delete 1st RS232 Dual Interface	Opt. D13	Opt. D13
Digital Recorder Interface	Opt. J14	Opt. J14
1st additional independent Display or Flatscreen Interface	With Opt. J26 ==> Opt. J16 (mono) or Opt. J25 (Flatscreen)	Opt. J15 (color) or Opt. J25(Flatscreen)
2nd additional independent Display or Flatscreen Interface *(1)*	—	With Opt. J28 ==> Opt. J15 (color) or Opt. J25(Flatscreen)
Peripherals		
Handheld Keypad	Standard	Standard
4-Channel Recorder	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A
14" Monochrome Display	M1092A (Opt. A03)	M1092A (Opt. A03)
14"Color Display	M1094B (Opt. A03)	M1094B (Opt. A03)
10.4" Flatscreen Color Display	M1095A (Opt. A03)	M1095A (Opt. A03)
21" Color Display*(3)*	M1165/6A (Opt. H71)	M1165/6A (Opt. H71)
Substitute Options		
Substitute Flatscreen display (Japan only) *(4) (5)*	Opt. H01	Opt. H01
Substitute 8-slot Satellite Rack for Integral Rack *(5)*	Opt. H50	Opt. H50
Substitute 6-slot Satellite Rack for Integral Rack *(5)*	Opt. H52	Opt. H52
Substitute 6-slot Satellite Rack for 8-slot. Satellite Rack *(M1177A only)*	Opt. H53	Opt. H53
Substitute 3 meter System Cable *(5)*	Opt. K02	Opt. K02
Substitute 1.5 meter System Cable *(5)*	Opt. K03	Opt. K03

(1) 2nd Independent Display Controller & an 8-channel Analog interface are not supported simultaneously.
(2) Includes a 3.0 meter (9.8 ft.) RS232 cable.
(3) Includes Isolation Transformer.
(4) Not available with Model M1175A.
(5) Not available with Model M1177A.

NCMS Release A.0

	M1176A (Color) M1177A (Color) Option A48
Display Module	
Color	Color
Number of Channels	8
Plug-in Modules	
Maximum Number of Parameter Modules	12 (16 with Opt. J28)
Supported Modules	
M1001A/B ECG *(1)*	1
M1002A/B ECG/RESP *(1)*	1
M1002A ECG/RESP with Analog Respiration Output (with Opt. C01) *(1) (2)*	1
M1006A/B Invasive Pressure	5 (6 with Opt. J28)
M1006A/B Invasive Pressure with Analog Pressure Output (with Opt. C01)	5 (6 with Opt. J28)
M1008B NBP *(2)*	1
M1012A Cardiac Output	1
M1015A Sidestream CO_2	1
M1016A CO_2	1
M1017A FiO_2	1
M1018A $tcpO_2$/$tcpCO_2$ *(2)*	1
M1020A SpO_2/Pleth	2
M1021A SvO_2 *(2)*	1
M1022A Blood Analysis *(2)*	1
M1029A Temperature	4 (2 Delta Temp.)
M1032A VueLink Type A	2
M1032A VueLink Type B	2
M1116A/B Recorder Module *(2)*	1
M1235A Data Transfer Module	1
Patient Data Management	
Standard Data Management	
12 second resolution	Standard
1 min. resolution	Standard
Extended Data Management	
12 second resolution	With Opt. J28
1 min. resolution	With Opt. J28
Trends	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation
Neonatal Event Review	Opt. C04
Respiratory Loops (for selected ventilators and Vuelink)	Opt. C80
Software Applications	
Drug Calculator	Standard
ST Segment Analysis	Standard

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) These modules require 2 slots in the integral and/or Satellite Rack.

Interfacing and Networking Capabilities	
8-Channel Analog Interface	Opt. J11
Philips Network Interface	Opt. J12
1st RS232 Interface	Opt. J13
2nd RS232 Interface	Opt. J13 and J28

	M1176A (Color) M1177A (Color)
	Option A48
Digital Recorder Interface	Opt. J14
Interfacing and Networking Capabilities	
Remote Keypad	Standard
4 Channel Recorder	M1117A
8-Slot Satellite Rack	M1041A
6-Slot Satellite Rack	M1276A
Substitute Options	
Substitute Flatscreen display (Japan only) *(1)*	Opt. H01
Substitute 8-slot Satellite Rack for Integral Rack *(1)*	Opt. H50
Substitute 6-slot Satellite Rack for Integral Rack *(1)*	Opt. H52
Substitute 6-slot Satellite Rack for 8-slot Satellite Rack *(M1177A only)*	Opt. H53
Substitute Short System Cable *(1)*	Opt. K01
Substitute 3 meter System Cable *(1)*	Opt. K02
Substitute 1.5 meter System Cable *(1)*	Opt. K03

(1) Not available with Model M1177A.

CMS Release B.0

	M1165A / 75A (Mono)	M1166A / 76A (Color) M1167A / 77A (Color)	
	Option A56	Option A66	Option A68
Display Module			
Mono / Color	Mono	Color	Color
Number of Channels	6	6	8
Supported Independent Displays	1 (2 with Option J26)	1 (2 with Option J26)	2
Plug-in Modules			
Maximum Number of Parameter Modules	8 (12 with Opt. J26)	8 (12 with Opt. J26)	12 (16 with Opt. J28)
Supported Modules			
M1001A/B ECG *(1)*	1	1	1
M1002A/B ECG/RESP *(1)*	1	1	1
M1002A ECG/RESP with Analog Respiration Output (with Opt. C01)*(1)(2)*	1	1	1
M1006A/B Invasive Pressure	3 (6 with Opt. J26)	3 (6 with Opt. J26)	5 (6 with Opt. J28)
M1006A/B Invasive Pressure with Analog Pressure Output (with Opt. C01)	3 (6 with Opt. J26)	3 (6 with Opt. J26)	5 (6 with Opt. J28)
M1008A/B NBP *(2)*	1	1	1
M1012A Cardiac Output	1	1	1
M1015A Sidestream CO_2	1	1	1
M1016A CO_2	1	1	1
M1017A FiO_2	1	1	1
M1018A $tcpO_2$/$tcpCO_2$ *(2)*	1	1	1
M1020A SpO_2/Pleth	2	2	2
M1021A SvO_2 *(2)*	1	1	1
M1022A Blood Analysis *(2)*	1	1	1
M1027A EEG *(3)*	1	1	1
M1029A Temperature	2 (1 Delta Temp.) 4 (2 Delta Temp. with Opt. J26)	2 (1 Delta Temp.) 4 (2 Delta Temp. with Opt. J26)	4 (2 Delta Temp.)
M1032A VueLink Type A	2	2	2
M1032A VueLink Type B	1 (2 with Opt. J26)	1 (2 with Opt. J26)	2
M1116A/B Recorder Module *(2)*	1	1	1
M1235A Data Transfer Module	1	1	1
Patient Data Management			
Standard Data Management			
12 sec. resolution	Standard	Standard	Standard
1 min. resolution	Standard	Standard	Standard
Extended Data Management			
12 sec. resolution	With Opt. J26	With Opt. J26	With Opt. J28
1 min. resolution	With Opt. J26	With Opt. J26	With Opt. J28
Trends	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	Hemodynamic Oxygenation Ventilation	Hemodynamic Oxygenation Ventilation	• Hemodynamic • Oxygenation • Ventilation
Neonatal Event Review	Opt. C04	Opt. C04	—
Respiratory Loops (for selected ventilators and Vuelink)	Standard	Standard	Standard

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) These modules require 2 slots in the integral and/or satellite rack.
(3) Not yet available in the U.S. and Canada.

Software Applications			
Drug Calculator	Standard	Standard	Standard
ST Segment Analysis	Standard	Standard	Standard
EASI™ 12-lead ECG with five electrodes	Option C12	Option C12	Option C12
CSA (with M1027A EEG Module)	Standard	Standard	Standard
Interfacing and Networking Capabilities			

CMS Release B.0

	M1165A / 75A (Mono)	M1166A / 76A (Color) M1167A / 77A (Color)	
	Option A56	**Option A66**	**Option A68**
8-Channel Analog Interface	Opt. J11	Opt. J11	Opt. J11
Philips Network Interface[4]	Opt. J12	Opt. J12	Opt. J12
1st RS232 Dual Interface	Opt. J13	Opt. J13	Opt. J13
2nd RS232 Dual Interface	Opt. J13 and Opt. J26	Opt. J13 and Opt. J26	Opt. J13 and Opt. J28
Digital Recorder Interface	Opt. J14	Opt. J14	Opt. J14
1st additional independent Display or Flatscreen Interface	Requires Opt. J26 with Opt. J15 (color) or Opt. J16 (mono) or Opt. J25 (Flatscreen)	Requires Opt. J26 with Opt. J15 (color) or Opt. J16 (mono) or Opt. J25 (Flatscreen)	Opt. J15 (color) or Opt. J16 (mono) or Opt. J25 (Flatscreen) or Opt. J17 (XGA display)[3]
Peripherals			
Handheld Keypad	Standard	Standard	Standard
4-Channel Recorder	M1117A	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A	M1276A
14 " Monochrome Display	M1092A (Opt. A03)	M1092A (Opt. A03)	M1092A (Opt. A03)
14 " Color Display	M1094B (Opt. A03)	M1094B (Opt. A03)	M1094B (Opt. A03)
10.4 " Flatscreen Color Display	M1095A (Opt. A03)	M1095A (Opt. A03)	M1095A (Opt. A03)
15 " XGA Flatscreen Color Display (1) (3)	—	M1097A #A01	M1097A #A01
21 " Color Display (1)	Opt. H71	Opt. H71	Opt. H71
Substitute Options			
Substitute 8-slot Satellite Rack for Integral Rack (2)	Opt. H50	Opt. H50	Opt. H50
Substitute 6-slot Satellite Rack for Integral Rack (2)	Opt. H52	Opt. H52	Opt. H52
Substitute 6-slot Satellite Rack for 8-slot Satellite Rack *(M1177A only)*	Opt. H53	Opt. H53	Opt. H53
Substitute 3 meter System Cable (2)	Opt. K02	Opt. K02	Opt. K02
Substitute 1.5 meter System Cable (2)	Opt. K03	Opt. K03	Opt. K03

(1) Includes isolation transformer.
(2) Not available with Model M1167A / 77A.
(3) Only with Model M1167A / 77A.
(4)) Included in standard configuration for US Models

ACMS Release B.0

	M1165A / 75A (Mono)	M1166A / 76A (Color) M1167A / 77A (Color)	
	Option A76	**Option A86**	**Option A88**
Display Module			
Mono / Color	Mono	Color	Color
Number of Channels	6	6	8
Supported Independent Displays	1 (2 with Option J26)	1 (2 with Opt. J26)	2 (3 with Opt. J28)
Plug-in Modules			
Max. Number of Parameter Modules	8 (12 with Opt. J26)	8 (12 with Opt. J26)	12 (16 with Opt. J28)
Supported Modules			
M1001A/B ECG (1)	1	1	1
M1002A/B ECG/RESP (1)	1	1	1
M1002A ECG/RESP with Analog Respiration Output (with Opt. C01) (1) (2)	1	1	1
M1006A/B Invasive Pressure	3 (6 with Opt. J26)	3 (6 with Opt. J26)	5 (6 with Opt. J28)
M1006A/B Invasive Pressure with Analog Pressure Output (with Opt. C01)	3 (6 with Opt. J26)	3 (6 with Opt. J26)	5 (6 with Opt. J28)
M1008A/B NBP (2)	1	1	1
M1012A Cardiac Output	1	1	1
M1015A Sidestream CO_2 (2)	1	1	1
M1016A CO_2	1	1	1
M1017A FiO_2	1	1	1
M1018A $tcpO_2$/$tcpCO_2$ (2)	1	1	1
M1020A SpO_2/Pleth	2	2	2
M1021A SvO_2 (2)	1	1	1
M1022A Blood Analysis (2)	1	1	1
M1027A EEG (3)	1	1	1
M1029A Temperature	2 (1 Delta Temp.) 4 (2 Delta Temp.) with Opt. J26	2 (1 Delta Temp.) 4 (2 Delta Temp.) with Opt. J26	4 (2 Delta Temp.)
M1032A VueLink Type A	2	2	2
M1032A VueLink Type B	1 (2 with Opt. J26)	1 (2 with Opt. J26)	2
M1116A/B Recorder Module (2)	1	1	1
M1235A Data Transfer Module	1	1	1
Anesthesia Gas Monitoring			
M1026A Anesthetic Gas Module	1	1	1
Anesthesia Ventilators			
Ohmeda 7800/7810	Standard	Standard	Standard
Ohmeda 7900	Opt. C79	Opt. C79	Opt. C79
Respiratory Loops (for selected ventilators &Vuelink)	Standard	Standard	Standard
Patient Data Management			
Standard Data Management 12 second resolution 1 min. resolution	Standard Standard	Standard Standard	Standard Standard
Extended Data Management 12 second resolution 1 min. resolution	With Opt. J26 With Opt. J26	With Opt. J26 With Opt. J26	With Opt. J28 With Opt. J28
Trends	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) These modules require 2 slots in the integral and/or satellite rack.
(3) Not yet available in the U.S. and Canada.

ACMS Release B.0

	M1165A / 75A (Mono)	M1166A / 76A (Color) M1167A / 77A (Color)	
	Option A76	Option A86	Option A88
Software Applications			
Drug Calculator	Standard	Standard	Standard
Dual SpO_2	Standard	Standard	Standard
ST Segment Analysis	Standard	Standard	Standard
EASI™ 12-lead ECG with five electrodes	Option C12	Option C12	Option C12
CSA (with M1027A EEG Module)	Standard	Standard	Standard
Interfacing and Networking Capabilities			
8-Channel Analog Interface *(1)*	Opt. J11	Opt. J11	Opt. J11
Philips Network Interface *(2)*	Opt. J12	Opt. J12	Opt. J12
1st RS-232 Dual Interface *(3)*	Standard	Standard	Standard
2nd RS-232 Dual Interface	Opt. J13	Opt. J13	Opt. J13
Delete 1st RS-232 Dual Interface	Opt. D13	Opt. D13	Opt. D13
Digital Recorder Interface	Opt. J14	Opt. J14	Opt. J14
1st additional independent Display or Flatscreen Interface	Requires Opt. J26 with Opt. J16 (mono)	Opt. J15 (color) or Opt. J25 (Flatscreen) or Opt. J17 (XGA display) *(6)*	Opt. J15 (color) or Opt. J25 (Flatscreen) or Opt. J17 (XGA display) *(6)*
2nd additional independent Display or Flatscreen Interface *(1)*	—	Requires Opt. J28 with Opt. J15 (color) or Opt. J25 (Flatscreen) or Opt. J17 (XGA display) *(6)*	Requires Opt. J28 with Opt. J15 (color) or Opt. J25 (Flatscreen) or Opt. J17 (XGA display) *(6)*
Peripherals			
Handheld Keypad	Standard	Standard	Standard
4-Channel Recorder	M1117A	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A	M1276A
14" Monochrome Display	M1092A (Opt. A03)	M1092A (Opt. A03)	M1092A (Opt. A03)
14" Color Display	—	M1094B (Opt. A03)	M1094B (Opt. A03)
10.4" Flatscreen Color Display	—	M1095A (Opt. A03)	M1095A (Opt. A03)
15" XGA Flatscreen Color Display *(4) (6)*	—	M1097A *(6)*	M1097A *(6)*
21" Color Display *(4)*	Opt. H71	Opt. H71	Opt. H71
Substitute Options			
Substitute 8-slot Satellite Rack for Integral Rack *(5)*	Opt. H50	Opt. H50	Opt. H50
Substitute 6-slot Satellite Rack for Integral Rack *(5)*	Opt. H52	Opt. H52	Opt. H52
Substitute 6-slot Satellite Rack for 8-slot Satellite Rack *(M1167A / 77A only)*	Opt. H53	Opt. H53	Opt. H53
Substitute 3 meter System Cable *(5)*	Opt. K02	Opt. K02	Opt. K02
Substitute 1.5 meter System Cable *(5)*	Opt. K03	Opt. K03	Opt. K03

(1) 2nd additional Independent Display Controller & an 8-channel Analog interface are not supported simultaneously.
(2) Standard in USA.
(3) Includes a 3.0 meter (9.8 ft.) RS-232 cable.
(4) Includes Isolation Transformer.
(5) Not available with Model M1167A / 77A.
(6) Only with Model M1167A / 77A.

NCMS Release B.0

	M1166A, M1167A, M1176A, M1177A Option A48
Display Module	
Color	Color
Number of Channels	8
Supported Independent Displays	2
Plug-in Modules	
Maximum Number of Parameter Modules	12 (16 with Opt. J28)
Supported Modules	
M1001A/B ECG *(1)*	1
M1002A/B ECG/RESP *(1)*	1
M1002A ECG/RESP with Analog Respiration Output (with Opt. C01) *(1) (2)*	1
M1006A/B Invasive Pressure	5 (6 with Opt. J28)
M1006A/B Invasive Pressure with Analog Pressure Output (with Opt. C01)	5 (6 with Opt. J28)
M1008B NBP *(2)*	1
M1012A Cardiac Output	1
M1015A Sidestream CO_2	1
M1016A CO_2	1
M1017A FiO_2	1
M1018A $tcpO_2$/$tcpCO_2$ *(2)*	1
M1020A SpO_2/Pleth	2
M1021A SvO_2 *(2)*	1
M1022A Blood Analysis *(2)*	1
M1027A EEG	1
M1029A Temperature	4 (2 Delta Temp.)
M1032A VueLink Type A	2
M1032A VueLink Type B	2
M1116A/B Recorder Module *(2) (3)*	1
M1235A Data Transfer Module	1
Patient Data Management	
Standard Data Management	
12 second resolution	Standard
1 min. resolution	Standard
Extended Data Management	
12 second resolution	With Opt. J28
1 min. resolution	With Opt. J28
Trends	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation
Neonatal Event Review	Opt. C04
Respiratory Loops (for selected ventilators and Vuelink)	Standard
Software Applications	
Drug Calculator	Standard
ST Segment Analysis	Standard
CSA (with M1027A EEG Module)	Standard

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) These modules require 2 slots in the integral and/or satellite rack.
(3) M1116A does not support recording of continuous oxyCRG or oxyCRG episodes.

Interfacing and Networking Capabilities

	M1166A, M1167A, M1176A, M1177A
	Option A48
8-Channel Analog Interface	Opt. J11
Philips Network Interface	Opt. J12
1st RS232 Dual Interface	Opt. J13
2nd RS232 Dual Interface	Opt. J13 and J28
Digital Recorder Interface	Opt. J14
Additional Independent Display Interface	Opt. J15 (color CRT) or Opt. J25 (Flatscreen) or Opt. J17 (XGA display)
Peripherals	
Handheld Keypad	Standard
4-Channel Recorder	M1117A
8-Slot Satellite Rack	M1041A
6-Slot Satellite Rack	M1276A
14 Inch Color Display	M1094B (Opt. A03)
10.4 Inch Flatscreen Color Display	M1095A (Opt. A03)
14 Inch XGA Flatscreen Color Display *(2) (3)*	M1097A
21 Inch Color Display *(2)*	Opt. H71
Substitute Options	
Substitute 8-slot Satellite Rack for Integral Rack *(1)*	Opt. H50
Substitute 6-slot Satellite Rack for Integral Rack *(1)*	Opt. H52
Substitute 6-slot Satellite Rack for 8-slot Satellite Rack *(M1167A / 77A only)*	Opt. H53
Substitute Short System Cable *(1)*	Opt. K01
Substitute 3 meter System Cable *(1)*	Opt. K02
Substitute 1.5 meter System Cable *(1)*	Opt. K03

(1) Not available with Model M1167A / 77A.
(2) Includes isolation transformer.
(3) Only with Model M1167A / 77A.

CMS Release C.0

	M1165A / 75A (Mono)	M1166A (Color) M1167A (Color)	M1166A / 76A (Color) M1167A / 77A (Color)	
	Option A56	**Option A64**	**Option A66**	**Option A68**
Display Module				
Mono / Color	Mono	Color	Color	Color
Number of Channels	6	4	6	8
Supported Independent Displays	1 (2 with Option J26)	1	1 (2 with Option J26)	2
Plug-in Modules				
Maximum Number of Parameter Modules	8 (12 with Opt. J26)	8	8 (12 with Opt. J26)	12 (16 with Opt. J28)
Supported Modules				
M1001A/B ECG *(1)*	1	1	1	1
M1002A/B ECG/RESP *(1)*	1	1	1	1
M1002A ECG/RESP with Analog Respiration Output (with Opt. C01)*(1)(2)*	1	1	1	1
M1006A/B Invasive Pressure without **or** with Analog Pressure Output (Opt.C01)	3 (6 with Opt. J26 (3))	3	3 (6 with Opt. J26 (3))	5 (6 with Opt. J28 (3))
M1008A/B NBP *(2)*	1	1	1	1
M1012A Cardiac Output without **or** with Option C10	1	1	1	1
M1015A Sidestream CO_2*(2)(4)*	1	1	1	1
M1016A CO_2	1	1	1	1
M1017A FiO_2	1	1	1	1
M1018A $tcpO_2$/$tcpCO_2$ *(2)*	1	1	1	1
M1020A SpO_2/Pleth	2	2	2	2
M1021A SvO_2 *(2)*	1	1	1	1
M1022A Blood Analysis *(2)*	1	1	1	1
M1027A EEG	1	1	1	1
M1029A Temperature	2 (1 Delta Temp.) 4 (2 Delta Temp. with Opt. J26)	2 (1 Delta Temp.)	2 (1 Delta Temp.) 4 (2 Delta Temp. with Opt. J26)	4 (2 Delta Temp.)
M1032A VueLink Type A	2	2	2	2
M1032A VueLink Type B	2 (3 with Opt. J26 and C32 (3))	2	2 (3 with Opt. J26 and C32 (3))	2 (3 with Opt. J28 and C32 (3))
M1034A BIS	1	1	1	1
M1116A/B Recorder Module *(2)*	1	1	1	1
M1235A Data Transfer Module	1	1	1	1
Patient Data Management				
Standard Data Management	Standard	Standard	Standard	Standard
Extended Data Management	Standard with Opt. J26	---	Standard with Opt. J26	Standard with Opt. J28
Trends	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation
Neonatal Event Review	Opt. C04	Opt. C04	Opt. C04	Opt. C04
Respiratory Loops (for selected ventilators and Vuelink)	Standard	Standard	Standard	Standard

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) These modules require 2 slots in the integral and/or satellite rack.
(3) Only 5 M1006A/B Invasive Pressure modules are supported if 3 Vuelink Type B modules are used.
(4) Requires CO_2 Module

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	M1165A / 75A (Mono)	M1166A (Color) M1167A (Color)	M1166A / 76A (Color) M1167A / 77A (Color)	
	Option A56	Option A64	Option A66	Option A68
Software Applications				
Drug Calculator	Standard	Standard	Standard	Standard
Dual SpO_2	Standard	Standard	Standard	Standard
ST Segment Analysis	Standard	Standard	Standard	Standard
EASI™ 12-lead ECG with five electrodes	Standard	Standard	Standard	Standard
CSA (with M1027A EEG Module)	Standard	Standard	Standard	Standard
Interfacing and Networking Capabilities				
8-Channel Analog Interface	Opt. J11	Opt. J11	Opt. J11	Opt. J11
Philips Network Interface *(4)*	Opt. J12	Opt. J12	Opt. J12	Opt. J12
1st RS232 Dual Interface	Opt. J13	Opt. J13	Opt. J13	Opt. J13
2nd RS232 Dual Interface *(5)*	Opt. J13	Opt. J13	Opt. J13	Opt. J13
Digital Recorder Interface	Opt. J14	Opt. J14	Opt. J14	Opt. J14
1st additional independent Display or Flatscreen Interface	Requires Opt. J26 with Opt. J16 (mono)		Requires Opt. J26 with Opt. J15 (color) or Opt. J16 (mono) or Opt. J17 (XGA display) or Opt. J25 (Flatscreen)	Opt. J15 (color) or Opt. J16 (mono) or Opt. J25 (Flatscreen) or Opt. J17 (XGA display) [3]
Peripherals				
Handheld Keypad	Standard	Standard	Standard	Standard
4-Channel Recorder	M1117A	M1117A	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A	M1276A	M1276A
14 " Monochrome Display	M1092A (Opt. A03)	M1092A (Opt. A03)	M1092A (Opt. A03)	M1092A (Opt. A03)
14 " Color Display	M1094B (Opt. A03)	M1094B (Opt. A03)	M1094B (Opt. A03)	M1094B (Opt. A03)
10.4 " Flatscreen Color Display	M1095A (Opt. A03)	M1095A (Opt. A03)	M1095A (Opt. A03)	M1095A (Opt. A03)
15 " XGA Touchscreen Color Display *(1) (3)*	—	M1097A #A02	M1097A #A02	M1097A #A02
21 " Color Display *(1)*	Opt. H71	Opt. H71	Opt. H71	Opt. H71
Substitute Options				
Substitute 8-slot Satellite Rack for Integral Rack *(2)*	Opt. H50	Opt. H50	Opt. H50	Opt. H50
Substitute 6-slot Satellite Rack for Integral Rack *(2)*	Opt. H52	Opt. H52	Opt. H52	Opt. H52
Substitute 6-slot Satellite Rack for 8-slot Satellite Rack *(M1177A only)*	Opt. H53	Opt. H53	Opt. H53	Opt. H53
Substitute 3 meter System Cable *(2)*	Opt. K02	Opt. K02	Opt. K02	Opt. K02
Substitute 1.5 meter System Cable *(2)*	Opt. K03	Opt. K03	Opt. K03	Opt. K03

(1) Includes isolation transformer.
(2) Not available with Model M1167A / 77A.
(3) Touchscreen operation available only when used as main display with models M1167A/77A.
(4) Included in standard configuration for US Models.
(5) For M1167A/77A, 2nd RS232 Interface is not available with Option H05.

ACMS Release C.0

	M1165A / 75A (Mono)	M1166A (Color) M1167A (Color)	M1166A / 76A (Color) M1167A / 77A (Color)	
	Option A76	Option A84	Option A86	Option A88
Display Module				
Mono / Color	Mono	Color	Color	Color
Number of Channels	6	4	6	8
Supported Independent Displays	1 (2 with Opt. J26)	1	1 (2 with Opt. J26)	2 (3 with Opt. J28)
Plug-in Modules				
Max. Number of Parameter Modules	8 (12 with Opt. J26)	8	8 (12 with Opt. J26)	12 (16 with Opt. J28)
Supported Modules				
M1001A/B ECG *(1)*	1	1	1	1
M1002A/B ECG/RESP *(1)*	1	1	1	1
M1002A ECG/RESP with Analog Respiration Output (with Opt. C01) *(1) (2)*	1	1	1	1
M1006A/B Invasive Pressure without **or** with Analog Pressure Output (Opt.C01)	3 (6 with Opt. J26 (4))	3	3 (6 with Opt. J26(4))	5 (6 with Opt. J28(4))
M1008A/B NBP *(2)*	1	1	1	1
M1012A Cardiac Output without **or** with Option C10	1	1	1	1
M1015A Sidestream CO_2 *(2) (3)*	1	1	1	1
M1016A CO_2	1	1	1	1
M1017A FiO_2	1	1	1	1
M1018A $tcpO_2$/$tcpCO_2$ *(2)*	1	1	1	1
M1020A SpO_2/Pleth	2	2	2	2
M1021A SvO_2 *(2)*	1	1	1	1
M1022A Blood Analysis *(2)*	1	1	1	1
M1027A EEG	1	1	1	1
M1029A Temperature	2 (1 Delta Temp.) 4 (2 Delta Temp.) with Opt. J26	2 (1 Delta Temp.)	2 (1 Delta Temp.) 4 (2 Delta Temp.) with Opt. J26	4 (2 Delta Temp.)
M1032A VueLink Type A	2	2	2	2
M1032A VueLink Type B	2 (3 with Opt. J26 and C32 (4))	2	2 (3 with Opt. J26 and C32(4))	2 (3 with Opt. J28 and C32(4))
M1034A BIS	1	1	1	1
M1116A/B Recorder Module *(2)*	1	1	1	1
M1235A Data Transfer Module	1	1	1	1
Anesthesia Gas Monitoring				
M1026A Anesthetic Gas Module	1	1	1	1
Anesthesia Ventilators				
Ohmeda 7800/7810	Standard	Standard	Standard	Standard
Ohmeda 7900	Opt. C79	Opt. C79	Opt. C79	Opt. C79
Respiratory Loops (selected ventilators &Vuelink)	Standard	Standard	Standard	Standard
Patient Data Management				
Standard Data Management	Standard	Standard	Standard	Standard
Extended Data Management	With Opt. J26	---	With Opt. J26	With Opt. J28
Trends	Tabular / Graphic	Tabular / Graphic	Tabular / Graphic	Tabular/Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) These modules require 2 slots in the integral and/or satellite rack.
(3) Requires CO_2 Module
(4) Only 5 M1006A/B Invasive Pressure modules are supported if 3 Vuelink Type B modules are used.

ACMS Release C.0

	M1165A / 75A (Mono)	M1166A (Color) M1167A (Color)	M1166A / 76A (Color) M1167A / 77A (Color)	
	Option A76	Option A84	Option A86	Option A88
Software Applications				
Drug Calculator	Standard	Standard	Standard	Standard
Dual SpO_2	Standard	Standard	Standard	Standard
ST Segment Analysis	Standard	Standard	Standard	Standard
EASI™ 12-lead ECG with five electrodes	Standard	Standard	Standard	Standard
CSA (with M1027A EEG Module)	Standard	Standard	Standard	Standard
Interfacing and Networking Capabilities				
8-Channel Analog Interface *(1)*	Opt. J11	Opt. J11	Opt. J11	Opt. J11
Philips Network Interface *(2)*	Opt. J12	Opt. J12	Opt. J12	Opt. J12
1st RS-232 Dual Interface *(3)*	Standard	Standard	Standard	Standard
2nd RS-232 Dual Interface *(4)*	Opt. J13	Opt. J13	Opt. J13	Opt. J13
Delete 1st RS-232 Dual Interface	Opt. D13	Opt. D13	Opt. D13	Opt. D13
Digital Recorder Interface	Opt. J14	Opt. J14	Opt. J14	Opt. J14
1st additional independent Display or Flatscreen Interface	Requires Opt. J26 with Opt. J16 (mono)		Opt. J15 (color) or Opt. J16 (mono) Opt. J25 (Flatscreen) or Opt. J17 (XGA display) *(6)*	Opt. J15 (color) or Opt. J16 (mono) or Opt. J25 (Flat) or Opt. J17 (XGA) *(6)*
2nd additional independent Display or Flatscreen Interface *(1)*	—	—	—	Requires Opt. J28 with Opt. J15 (color) or Opt. J25 (Flat) or Opt. J17 (XGA) *(6)*
Peripherals				
Handheld Keypad	Standard	Standard	Standard	Standard
4-Channel Recorder	M1117A	M1117A	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A	M1276A	M1276A
14" Monochrome Display	M1092A (Opt. A03)	M1092A (Opt. A03)	M1092A (Opt. A03)	M1092A (Opt. A03)
14" Color Display	—	M1094B (Opt. A03)	M1094B (Opt. A03)	M1094B (Opt. A03)
10.4" Flatscreen Color Display	—	M1095A (Opt. A03)	M1095A (Opt. A03)	M1095A (Opt. A03)
15" XGA Touchscreen Color Display *(5) (6)*	—	M1097A # A02 *(6)*	M1097A # A02 *(6)*	M1097A # A02 *(6)*
21" Color Display *(5)*	Opt. H71	Opt. H71	Opt. H71	Opt. H71
Substitute Options				
Substitute 8-slot Satellite Rack for Integral Rack *(7)*	Opt. H50	Opt. H50	Opt. H50	Opt. H50
Substitute 6-slot Satellite Rack for Integral Rack *(7)*	Opt. H52	Opt. H52	Opt. H52	Opt. H52
Substitute 6-slot Satellite Rack for 8-slot Satellite Rack *(M1167A / 77A only)*	Opt. H53	Opt. H53	Opt. H53	Opt. H53
Substitute 3 meter System Cable *(7)*	Opt. K02	Opt. K02	Opt. K02	Opt. K02
Substitute 1.5 meter System Cable *(7)*	Opt. K03	Opt. K03	Opt. K03	Opt. K03

(1) 2nd additional Independent Display Controller & an 8-channel Analog interface are not supported simultaneously.
(2) Standard in USA.
(3) Includes a 3.0 meter (9.8 ft.) RS-232 cable.
(4) For M1167A/77A, 2nd RS232 Interface is not available with Option H05.
(5) Includes Isolation Transformer.
(6) Touchscreen operation available only when used as main display with models M1167A/77A.
(7) Not available with Model M1167A / 77A.

NCMS Release C.0

	M1166A (Color) M1167A (Color)	M1166A, M1167A, M1176A, M1177A
	Option A44	**Option A48**
Display Module		
Color	Color	Color
Number of Channels	4	8
Supported Independent Displays	1	2
Plug-in Modules		
Maximum Number of Parameter Modules	8	12 (16 with Opt. J28)
Supported Modules		
M1001A/B ECG *(1)*	1	1
M1002A/B ECG/RESP *(1)*	1	1
M1002A ECG/RESP with Analog Respiration Output (with Opt. C01) *(1) (2)*	1	1
M1006A/B Invasive Pressure without **or** with Analog Pressure Output (Opt.C01)	3	5 (6 with Opt. J28 (5))
M1008B NBP *(2)*	1	1
M1012A Cardiac Output without **or** with Option C10	1	1
M1015A Sidestream CO_2 *(2) (3)*	1	1
M1016A CO_2	1	1
M1017A FiO_2	1	1
M1018A $tcpO_2$/$tcpCO_2$ *(2)*	1	1
M1020A SpO_2/Pleth	2	2
M1021A SvO_2 *(2)*	1	1
M1022A Blood Analysis *(2)*	1	1
M1027A EEG	1	1
M1029A Temperature	2 (1 Delta Temp.)	4 (2 Delta Temp.)
M1032A VueLink Type A	2	2
M1032A VueLink Type B	2	2 (3 with Opt. J28 and C32(5))
M1034A BIS	1	1
M1116A/B Recorder Module *(2) (4)*	1	1
M1235A Data Transfer Module	1	1
Patient Data Management		
Standard Data Management 12 second resolution	Standard	Standard
1 min. resolution	Standard	Standard
Extended Data Management 12 second resolution	---	With Opt. J28
1 min. resolution	---	With Opt. J28
Trends	Tabular / Graphic	Tabular / Graphic
Clinical Calculations	• Hemodynamic • Oxygenation • Ventilation	• Hemodynamic • Oxygenation • Ventilation
Neonatal Event Review	Opt. C04	Opt. C04
Respiratory Loops (for selected ventilators and Vuelink)	Standard	Standard
Software Applications		
Drug Calculator	Standard	Standard
Dual SpO_2	Standard	Standard
ST Segment Analysis	Standard	Standard
CSA (with M1027A EEG Module)	Standard	Standard

(1) M1001A/B and M1002A/B cannot be used simultaneously in a system.
(2) These modules require 2 slots in the integral and/or satellite rack.
(3) Requires CO_2 Module
(4) M1116A does not support recording of continuous oxyCRG or oxyCRG episodes.
(5) Only 5 M1006A/B Invasive Pressure modules are supported if 3 Vuelink Type B modules are used.

NCMS Release C.0

	M1166A (Color) M1167A (Color)	M1166A, M1167A, M1176A, M1177A
	Option A44	**Option A48**
Interfacing and Networking Capabilities		
8-Channel Analog Interface	Opt. J11	Opt. J11
Philips Network Interface *(1)*	Opt. J12	Opt. J12
1st RS232 Dual Interface	Opt. J13	Opt. J13
2nd RS232 Dual Interface *(2)*	Opt. J13	Opt. J13
Digital Recorder Interface	Opt. J14	Opt. J14
Additional Independent Display Interface		Opt. J15 (color CRT) or Opt. J25 (Flatscreen) or Opt. J17 (XGA display)
Peripherals		
Handheld Keypad	Standard	Standard
4-Channel Recorder	M1117A	M1117A
8-Slot Satellite Rack	M1041A	M1041A
6-Slot Satellite Rack	M1276A	M1276A
14 Inch Color Display	M1094B (Opt. A03)	M1094B (Opt. A03)
10.4 Inch Flatscreen Color Display	M1095A (Opt. A03)	M1095A (Opt. A03)
15" XGA Touchscreen Color Display *(3) (4)*	M1097A #A02	M1097A #A02
21 Inch Color Display *(3)*	Opt. H71	Opt. H71
Substitute Options		
Substitute 8-slot Satellite Rack for Integral Rack *(5)*	Opt. H50	Opt. H50
Substitute 6-slot Satellite Rack for Integral Rack *(5)*	Opt. H52	Opt. H52
Substitute 6-slot Satellite Rack for 8-slot Satellite Rack *(M1167A / 77A only)*	Opt. H53	Opt. H53
Substitute Short System Cable *(5)*	Opt. K01	Opt. K01
Substitute 3 meter System Cable *(5)*	Opt. K02	Opt. K02
Substitute 1.5 meter System Cable *(5)*	Opt. K03	Opt. K03

(1) Included in standard configuration for US Models.
(2) For M1167A/77A, 2nd RS232 Interface is not available with Option H05.
(3) Includes isolation transformer.
(4) Touchscreen operation available only when used as main display with models M1167A/77A.
(5) Not available with Model M1167A / 77A.

Appendix B Conversion Charts

Tables

Table B-1 Common Conversions

Measure	Metric Conversion	English Conversions
Length	1 meter = 3.28 feet 1 centimeter = 0.39 inches 1 millimeter = 0.04 inches	1 foot = 0.305 meters 1 inch = 2.54 centimeters 1 inch = 25.40 millimeters
Mass and Weight	1 kg = 2.21 lbs 1 gram = 0.35 ounces	1 lb. = 0.45 kgs 1 ounce = 28.35 grams
Volume	1 liter = 0.26 gallons 1 liter = 2.12 pints	1 gallon = 3.79 liters 1 pint = 0.47 liters
Pressure	1 mmHg = 0.15 kPa	1 kPa = 6.67 mmHg
Temperature	F = 1.8*^{o}C + 32°	C = 0.56* (^{o}F - 32°)

Table B-2 Weight Conversions

English	Metric	English	Metric
100 lbs	45 kgs	170 lbs	77 kgs
105 lbs	47 kgs	175 lbs	80 kgs
110 lbs	50 kgs	180 lbs	82 kgs
115 lbs	52 kgs	185 lbs	84 kgs
120 lbs	55 kgs	190 lbs	86 kgs
125 lbs	57 kgs	195 lbs	88 kgs
130 lbs	59 kgs	200 lbs	90 kgs
135 lbs	61 kgs	205 lbs	92 kgs
140 lbs	64 kgs	210 lbs	95 kgs
145 lbs	66 kgs	215 lbs	97 kgs
150 lbs	68 kgs	220 lbs	99 kgs
155 lbs	70 kgs	225 lbs	101 kgs
160 lbs	73 kgs	230 lbs	104 kgs
165 lbs	74 kgs	235 lbs	106 kgs

Table B-3 Length Conversions

English	Metric	English	Metric
4’ 5”	135 cm	5’ 7”	170 cm
4’ 6”	137 cm	5’ 8”	173 cm
4’ 7”	140 cm	5’ 9”	175 cm
4’ 8”	142 cm	5’ 10”	178 cm
4’ 9”	145 cm	5’ 11”	180 cm
4’ 10”	147 cm	6’	183 cm
4’ 11”	150 cm	6’ 1”	185 cm
5’	152 cm	6’ 2”	188 cm
5’ 1”	155 cm	6’ 3”	191 cm
5’ 2”	157 cm	6’ 4”	193 cm
5’ 3”	160 cm	6’ 5”	196 cm
5’ 4”	163 cm	6’ 6’	198 cm
5’ 5”	165 cm	6’ 7”	201 cm
5’ 6”	168 cm	6’ 8”	203 cm

Table B-4 Altitude Switch Settings

SW Set	Alt (Meters)	Alt (Feet)	Bar Press/mmHg
00	0-50	0-164	760-756
01	51-150	165-492	755-747
02	151-250	493-820	746-729
03	251-350	821-1148	736-729
04	351-450	1149-1475	728-720
05	451-550	1476-1803	719-712
06	551-650	1804-2131	711-703
07	651-750	2132-2459	702-694
08	751-850	2460-2787	693-685
9	851-950	2788-3115	694-677
10	951-1050	3116-3443	676-669
11	1051-1150	3444-3771	668-660
12	1151-1250	3772-4098	659-653
13	1251-1350	4099-4426	652-644
14	1351-1450	4427-4754	643-636
15	1451-1550	4755-5082	635-628
16	1551-1650	5083-5410	627-619
17	1651-1750	5411-5738	619-612
18	1751-1850	5739-6066	611-605
19	1851-1950	6067-6395	604-597
20	1950-2050	6396-6723	596-590
21	2051-2150	6724-7051	589-580
22	2151-2250	7052-7378	579-574
23	2251-2350	7379-7706	573-567
24	2351-2450	7707-8034	566-559
25	2451-2550	8035-8364	558-553
26	2551-2650	8365-8690	552-545
27	2651-2750	8691-9018	544-537
28	2751-2850	9019-9846	536-530
29	2851-2950	9347-9673	529-523
30	2951-3050	9674-10000	522-516
31	3051-3150	10001-10328	515-509
32	3151-3250	10329-10656	508-503
33	3251-3350	10627-10984	502-496
34	3351-3450	10985-11311	495-489
35	3451-3550	11312-11639	488-483
36	3551-3650	11640-11967	482-476
37	3651-3750	11968-12295	475-470
38	3751-3850	12296-12623	469-463
39	3851-3950	12624-12951	462-456
40	3951-4050	12952-13279	455-450
41	4051-4150	13280-13607	449-444
42	4151-4250	13608-13934	443-438
43	4251-4350	13935-14262	437-432
44	4351-4450	14263-14590	431-426
45	4451-4550	14591-14918	425-420
46	4551-4650	14919-15246	419-414
47	4651-4750	15247-15574	413-408
48	4750-4850	15575-15904	407-403
49	4851-4950	15905-16066	402-399

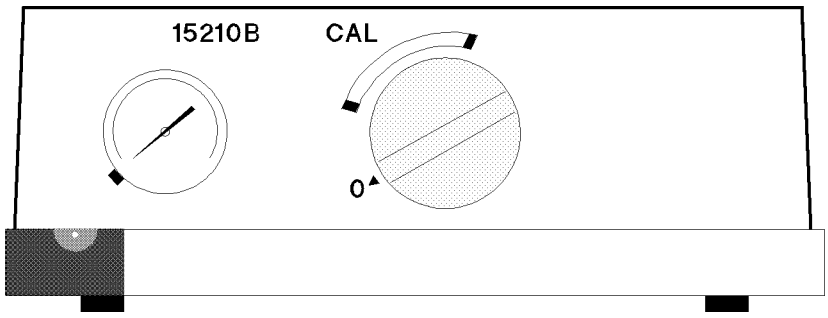
Appendix C Philips 15210B Calibration Unit

Installation

Description

The Philips 15210B Calibration Unit consists of a gas cylinder connected to a gas outlet via a time controlled valve. The valve is normally closed, ensuring that no gas is lost when the unit is not in use. When the unit is set up for use and the timer control knob is turned, gas is directed to the calibration chamber on the $tcpO_2$/$tcpCO_2$ module (Philips M1018A) for a period of up to 20 minutes. After this time the valve automatically closes.

This section provides the necessary information for you to install and service the Philips 15210B.



Calmod.tif

Unpacking the Instrument

If external damage to the shipping carton is evident, ask the carrier's agent to be present when the unit is unpacked.

Initial Inspection

Check the instrument for any external damage such as dents and scratches on panel surfaces. If the shipping carton is not damaged, check the cushioning material and note any signs of severe stress as an indication of rough handling in transit. Retain the packaging material for possible repacking.

Claims for Damage

If physical damage is evident when the Calibration Unit is received or the unit does not meet the specified operational requirements, please notify the carrier and the nearest Philips Sales/Service office immediately. The Sales/Service office will arrange for repair or replacement without waiting for settlement of the claim against the carrier.

Repacking for Shipment or Storage

If the Calibration Unit is to be shipped to a Philips Sales/Service office, securely attach a tag showing the name and address of the owner, the model and serial number, and the repair required or symptoms of the fault. If available and reusable, the original shipping carton and packaging material should be used to provide adequate protection during shipping. The Philips Sales/Service office will provide information and recommendations on materials to be used if the original material is not available or reusable.

Instrument Identification

Philips uses a nine character sequence for instrument identification. The serial number is located on a plate attached to the rear panel of the instrument.

Specification

Gas Supply:	1 low pressure cylinder.
Gas Flow:	8 ml +4/-2 ml per minute for 15210-64010, 12 ml +4/-2 ml per minute for 15210-60010.
Cylinder Pressure:	Indicated by an integral pressure manometer.
Timer Period:	20 minutes.
Dimensions:	90mm (35.4in) high x 220mm (86.6in) wide x 235mm (92.5in) deep, (without cylinder).
Weight:	2.4 kg (5.3lbs), (without cylinder).

NOTE The 15210B is intended for use with Philips “CAL 1” gas cylinders (part number 15210-60010 **or** 15210-64010 for Europe and Japan).

Operating Environment

The environment where the Philips 15210B will be used should be reasonably free from vibration, dust, corrosive or explosive gases, extremes of temperature, humidity, etc. The Philips 15210B operates within specifications at ambient temperatures between 0°C and 55°C. The maximum operating relative humidity is 95% at 40°C. Ambient temperatures or humidities which exceed these limits could affect the accuracy of the calibration unit and cause damage to components.

Operating Information

Each Philips 15210B is delivered with a multilanguage collection of stick-on operating labels. Each label summarizes day-to-day operating procedures using the Calibration Unit. It is intended to be stuck to the top surface of the Unit; however, it may be attached to any flat, grease-free surface.

To attach label: Clean the surface where the label is to be placed with soapy water to remove any dirt or grease. Dry the surface thoroughly. Peel off the paper backing and carefully place the label in the required position. Press down firmly with a clean dry cloth, paying particular attention to the edges.

Fitting the Gas Cylinders

When the Calibration Unit is delivered, no gas cylinder is fitted. Before putting the unit into service, screw the cylinder into the opening in the rear panel (See “Routine Maintenance” on page C-4, next section).

When new, the calibration unit will contain a small amount of normal air. To expel this air before use and thus prevent inaccurate calibration, turn the timer control fully clockwise after fitting the gas cylinders and allow it to run for the full period. The calibration unit is now ready for use.

Storage of Gas Cylinders

New gas cylinders should be stored in a cool place and not exposed to direct sunlight.

Disposal of Used Gas Cylinders

Do not crush or incinerate used gas cylinders. They may be disposed of as scrap metal.

Routine Maintenance

Changing the Gas Cylinders

Before each calibration the gas pressure indicator on the Philips 15210B front panel should be read. If the indicator is in the “black” zone, change the gas cylinder as follows:

Step 1 From the rear of the unit turn the empty gas cylinder anti-clockwise until the cylinder is free (3-6 turns).

Step 2 Withdraw the empty cylinder.

Step 3 Take a full gas cylinder and insert it squarely into the rear of the unit. Turn clockwise until hand tight.

Step 4 Check that the pressure indicator is no longer in the “black” zone.

Care and Cleaning

Keep the surfaces of the calibration unit clean and free of dust and dirt. Clean regularly with a lint-free cloth or sponge dampened in soapy water. Avoid using alcohol or ammonia based cleaners which may damage the Calibration Unit. Other strong cleaners such as Povidine RR, Lysol R and Mikroklene R are not recommended since they may stain the unit. Do not pour any liquid on the instrument while cleaning. Never use an abrasive material such a steel wool or metal polish. Cleaning agents and disinfectants should only be used in cases of stubborn dirt. If used, carefully remove any remaining traces of cleaning agent or disinfectant with clean water.

NOTE Do not allow water to enter the gas outlet.

To clean the gas outlet: Use cotton wool soaked in soapy water to remove any deposits which may collect in the outlet. Dry the outlet thoroughly after cleaning. In the case of severe blockages, a thin length of wire may be used to free the outlet pipe.

Theory of Operation

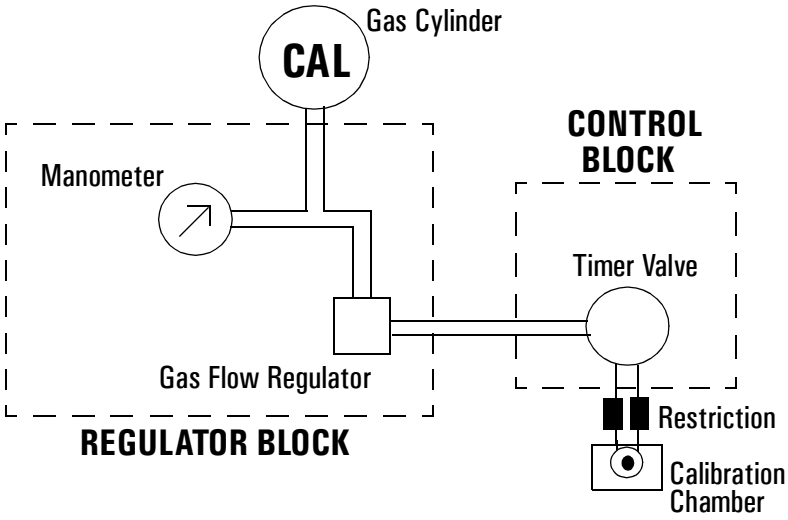


Figure C-1 Block diagram - Internal Components

The gas cylinder is screwed directly into a pressure *regulator block*. This block ensures that, in combination with the *restriction*, the gas flow remains constant as the pressure in the cylinders falls with use. From the regulation block the gas is channelled to the *control block*. The gas passes into the control block via an opening in the side sealed with an "O" ring and filter. The control block acts as a switch.

A restriction piece is fitted in the tubing connecting the control block to the gas outlet. The restriction helps to regulate the gas flow.

Gas Flow Performance Check

Philips recommends that the following gas flow check is conducted once a year.

Test Procedure

Step 1 Check that the pressure indicator is not in the black zone (i.e. that there is an adequate supply of gas in the cylinder).

Step 2 Fit gas tubing to the gas outlet, then take the free end and fit it to a water-filled syringe in a glass of water.

Step 3 Turn the timer control fully clockwise and note the volume of water displaced after 60 seconds.

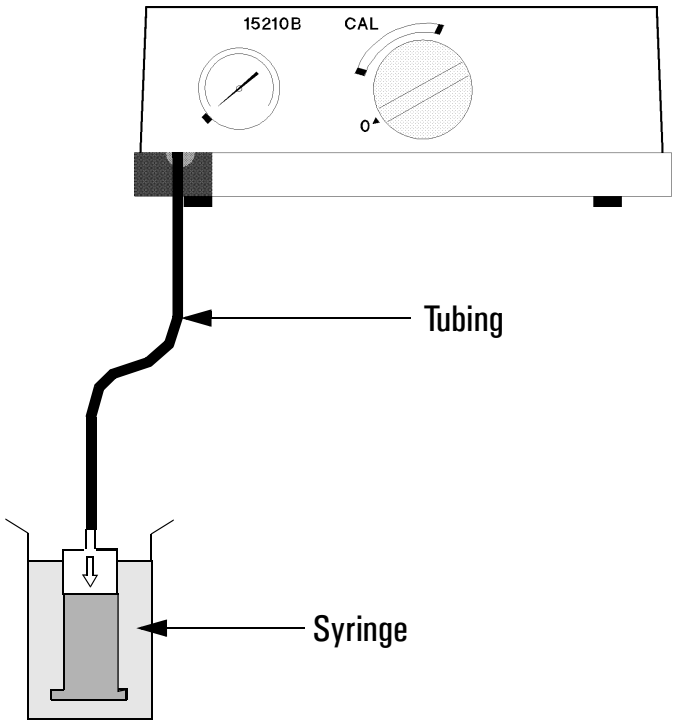


Figure C-2 Test Procedure

Action if outside specification

The volume of water displaced in 60 seconds should be 8ml (4/-2ml) for the 15210-64010 gas cylinder or 12ml (+4/-2ml) for the 15210-60010 gas cylinder. If the displacement is within the appropriate one of these ranges, the supply of gas in within specification.

If the gas flow is less that the permitted minimum, remove the Calibration Unit cover (see *Cover Removal* in the next section) and look for an occlusion or leakage.

If the gas flow is greater than the permitted maximum, follow the procedure below:

Step 1 Replace the gas cylinder with a new cylinder.

Step 2 Turn the *Gas flow adjuster screw* on the underside of the unit to reduce the gas flow (see next figure to locate the gas flow adjuster).

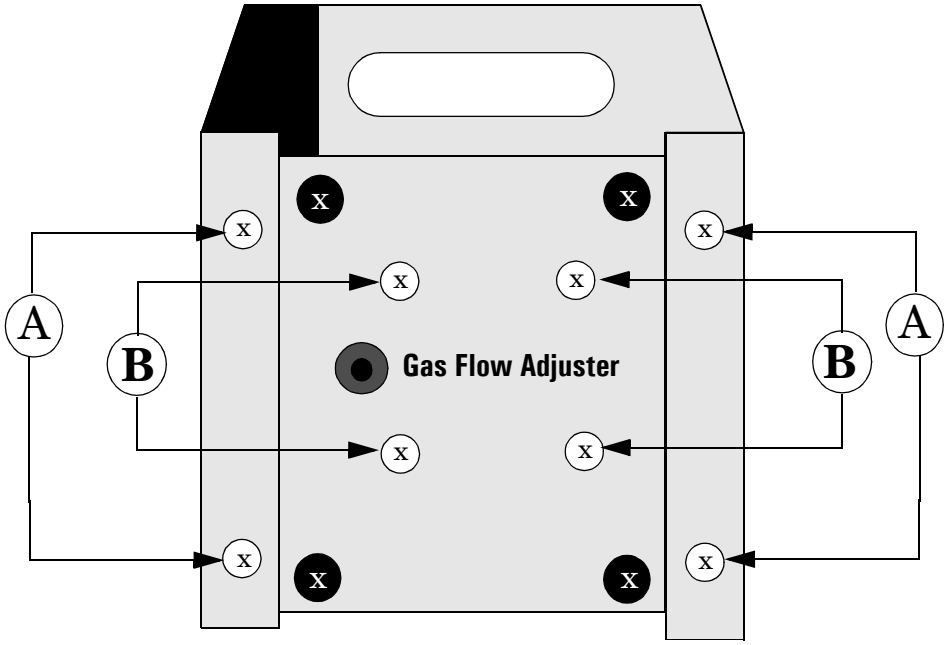


Figure C-3 Calibration Unit viewed from underneath

Step 3 Repeat the gas flow performance check described above. If the gas flow is still significantly greater than the permitted maximum, remove the cover following the procedure *(Cover Removal)* below.

Step 4 Remove the flow restriction by pulling the tubing off (see Figure 3-4), select a new restriction from the set of restriction pieces (part number 15210-68703) and fit in the unit.

Step 5 Reassemble the unit and repeat the gas flow performance check.

Step 6 Turn the gas flow adjuster screw as necessary.

Step 7 If the gas flow is still greater that the specified rate, repeat the above steps, inserting a longer restriction.

Disassembly

Tools Required: Pozidrive screwdriver, size GN1, Normal screwdriver, size 1/7, Hex-key (Allen-key), size SW 3mm.

Step 1 Cover Removal

1. Remove the gas cylinder from the calibration unit.
2. Remove the four screws on the base of the unit (labeled A – see figure).
3. Slide the cover off towards the rear of the unit.

Step 2 Timer Control Knob

1. The timer control know is secured with a “grub-screw” located in the side of the knob. Loosen this screw approximately 2 turns. The knob can now be pulled off.

Step 3 Regulator / Control Block Removal

1. Complete operations 1 and 2 above.
2. Remove the connection pipe from the rear of the Calibration Chamber.
3. Unscrew the four remaining screws on the unit base (labeled B in the figure) to release the Regulator / Control Block.
4. The two screws on the regulator block side can now be removed to separate the regulator block from the control block. Be careful not to misplace the “O” ring and filter which are fitted between the two blocks.

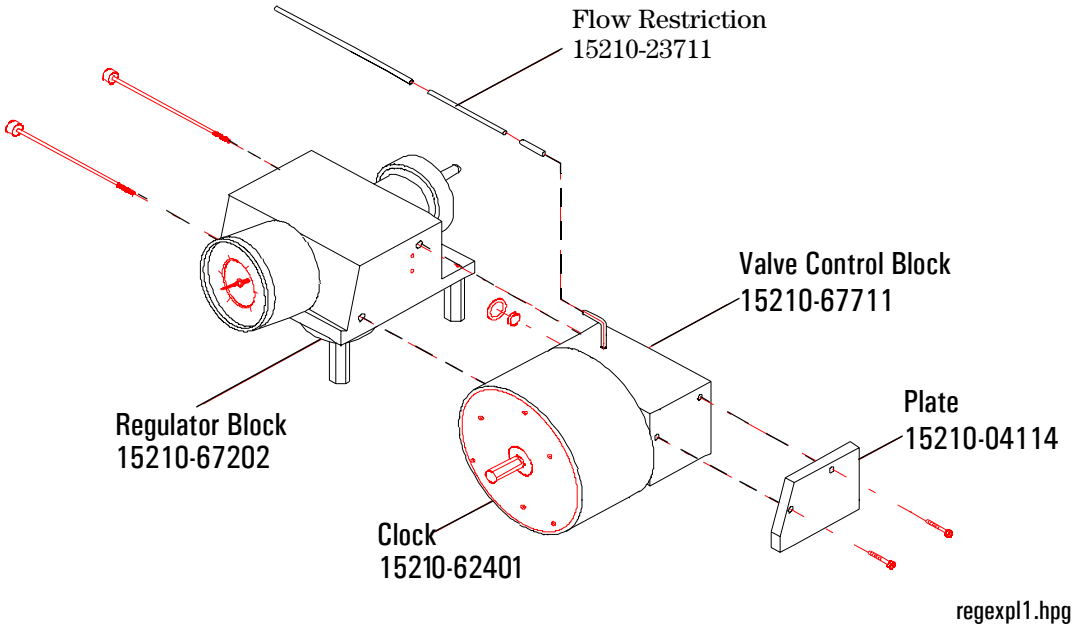


Figure C-4 Exploded view - Regulator and Control Blocks

Parts List

Table C-1 Replaceable Parts for the 15210B

Part Number	Description
15210-47101	Flat sealing ring (to seal gas bottle)
15210-47106	Membrane foil
15210-62401	Clock
15201-67711	Valve control block
15210-67202	Regulator block left
15210-23711	Flow regulator restriction
0905-0678	8mm ring - between valve control block and regulator block
15210-27401	Timer control knob
0515-0777	Screw M6x8 (for timer control knob)
15210-04111	Cover - bottom
15210-04102	Cover - top
15210-24702	Spacer - hexagonal nut for mounting regulator bloc
15210-62302	Gas outlet block
15210-68703	Set of restrictions for adjusting gas flow
M2205A	Calibration tubing (set of 5)

Appendix D CPC Programming Tool Manual

Introducing the CPC Programming Tool

The CPC Programming Tool provides a means of servicing and upgrading Philips products which utilize Flash memory technology. The tool interfaces to devices that have a human interface via a service port connector, and in the future will use an RS232 connector for devices without a human interface. The service port cable which is provided is a 20-wire ribbon cable and is 18 inches long.

This manual provides the functional description and troubleshooting procedures of the Philips CPC Programming Tool. Programming procedures are found in the installation note for the specific product being programmed.

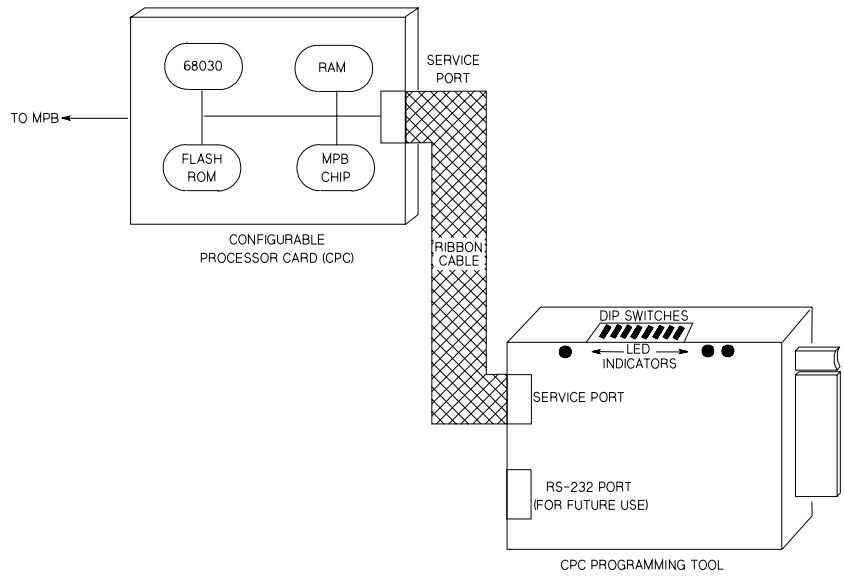


Figure D-1 Philips CPC Programming Tool connected to a Service Port.

Parts Checklist

The Philips CPC Programming Tool Kit (M2300-67100) contains the following parts:

- Philips CPC Programming Tool (ET-36733)
- Service Port Ribbon Cable (M2300-67200)
- Ground Cable (M2300-67210)

Power Requirements

The CPC Programming Tool draws +5 Vdc from the host product to arm the internal Vpp converter and power the internal circuitry.

Host Product Compatibility

The following products can use the CPC Programming Tool:

- CMS Patient Monitoring System (all models)
- Anesthesia CMS Patient Monitoring System (all models)
- Component Central Monitor (all models)
- Component Transport System

Accessories

To use the tool, you will also need a product-specific Programming Card, which is ordered separately from the Philips Support Materials Organization (SMO) or Philips Parts Center Europe (PCE).

There are two types of Programming Cards for most products; one is intended for the customer and the other for Philips internal personnel performing warranty functions. For example, the Philips CMS Patient Monitoring System has the CPC Programming Card and the CPC Programming Card – Philips Internal Only. Both cards are programmed for the same basic functions but the Philips Internal Only card can perform warranty-specific functions and is available only to Philips personnel.

CPC Programming Tool Functional Description

The Philips CPC Programming Tool consists of a protective case housing a single printed circuit board (PCB) and the Programming Card slot. The host product specific Programming Card is inserted into the programming tool by sliding the card into the tool until it snaps into place. The card can be removed by pressing the card eject button.

All of the functional circuits of the programming tool are contained on the PCB. The PCB can be broken down into the following functional areas:

- Programming Card Interface
- Internal tool EEPROM
- VPP converter
- DIP switches
- Service Port connector
- RS-232 connector
- LED indicators

Programming Card Interface

The main component of the programming tool is the Programming Card interface. The Programming Card is specific for each host product. The Programming Card contains the current or new version of the host product software and boot program to provide the programming functionality. The speed of the data transfer from the Programming Card to the host product is dictated by the speed at which the host product updates its internal ROM. This varies from product to product. Upgrade data is downloaded to the host product at boot up when the dip switches on the programming tool are configured properly and the Programming Card is inserted properly. This inserts a boot signal on the host product, causing the host product to change its address map and boot from the Programming Card. The host product then copies appropriate routines to its RAM and executes the routines from there, with additional accessing of the Programming Card for byte reads of the upgrade code.

Internal EEPROM

The programming tool contains two separate 32K x 8 EEPROM.

VPP Converter

The VPP converter is a 5VDC to 12VDC converter that supplies power to program four Flash chips at 12VDC at 120 mA. If the host product supplies 12VDC, the VPP converter is turned off by the tool's internal software.

DIP Switches

The programming tool contains eight DIP switches that are read during programming tool operation. The switches are set specifically to interface with the software running in the host product.

Service Port Interface

The service port interface is a 32 Kbyte address space extension allowing the host product read/write access to the programming tool. A signal from the tool indicates to the host product hardware to remap the service port. When this is active, the host product maps the programming tool's 32 K address space. The CPC vectors and boot routine are now accessed from the Programming Card through the service port. Because the service port address space is limited, the addressing of the Programming Card is done through bank switching. A bank is defined as continuous blocks of 8 Kbytes. The service port is set up as four banks.

Data Transfer Byte wide bus transfers are completed between the tool and the host product. The data transfer can be in either direction.

Boot Up The boot routine is inserted by the programming tool upon the host product power up if DIP switches are set properly and a Programming Card is properly inserted into the tool. The boot routine causes the host product to boot from the Programming Card instead of the host product boot code.

RS232 Interface The RS-232 interface is not yet supported, but in the future it will provide several functions for the tool. For a host product without a human interface, a PC will be connected to the product through the tool. In this setup, the host product will be upgraded by moving data directly from a floppy to the Flash ROM of the product.

LED Indicators Three LED indicators (one red, two green) provide visual indications of the status of the programming tool and the status of the function being performed.

These LEDs are labeled on the programming tool as follows:

- STATUS (green)
- PASS (green)
- FAIL (red)

Before Using the CPC Programming Tool

CAUTION

To prevent damage, do not handle the Philips CPC Programming Tool until the following conditions are met:

- An anti-static mat must be used.
- In addition to the table mat, the person performing the upgrade operation should either:
- Wear a conductive wrist strap attached to the host product chassis by the wire included with the strap, or
- Stand on a floor mat with leather-soled shoes. The floor mat also has an isolation resistor in series with its ground lead for personnel protection.
- When transporting PCBs, carry them in their shipping containers.
- To protect CMOS integrated circuits (ICs), never transport them loose since it may result in damaging them by a static discharge or in damaging or misaligning their pins.
- When transporting PCB's, carry them in their shipping containers.
- To protect CMOS integrated circuits (ICs), never transport them loose since it may result in damaging them by a static discharge or in damaging or misaligning their pins
- Before handling any PCBs, firmly touch the exposed metal on the case of the tool to equalize the ground potentials. This prevents static discharge and protects CMOS logic components.
- Handle PCBs by the edges only. Avoid touching PCB surfaces unless replacing components. Contaminants such as skin-oil cause dust to accumulate which can retain moisture and damage the circuits.

NOTE

Before using the CPC Programming Tool on any Philips product, make a list of the user configuration settings that will be set to default values when performing a standard upgrade.

Using the CPC Programming Tool

The following procedures describe the general uses of the CPC Programming Tool.

NOTE

Before using the Philips CPC Programming Tool on any monitor make a list of the user configuration settings that will be set to default values when performing a standard upgrade.

Before connecting the CPC Programming Tool the monitor must be turned off. Failure to do this could cause the CPC Programming Card in the tool to be corrupted.

The monitor must always be connected to AC power during the upgrade operations. Connecting the unit to AC power insures the unit is connected to earth ground, decreasing the likelihood of damage to the unit due to ESD.

Connect the Tool

To connect the CPC programming tool to a monitor, perform the following procedure:

Step 1 Turn the monitor OFF.

Step 2 Expose the Flash Upgrade service port on the monitor. The location of the port is monitor dependent.

Step 3 Attach the ground wire to the CMS.

Step 4 Attach either end of the ribbon cable to the tool, then plug the other end of the cable into the Flash Upgrade service port.

Step 5 Insert the appropriate CPC Programming Card into the tool.

Step 6 Check the switch settings on the CPC Programming Tool.

CMS	All switches down
ACMS	Switch 2 is up, all other switches down
CTS	All switches down
CCM	Switch 1 is up, all other switches down

Step 7 Turn the monitor ON. The screen displays the status message `Config Mode Active - NO MONITORING!` accompanied by text which identifies the version of the programming tool being used.

If the system does not respond as expected, see the Troubleshooting section at the end of this note.

Step 8 Press Instrument Config or Monitor Setup to display the Instrument Configuration or setup screen. The screen displays the softkeys that are specific to the monitor's software. To provide security against unauthorized use, some of the softkeys are disabled (darkened) until the password is entered.

Enter the Password

To enter the password, select the Password Entry softkey followed by the password. The default password is 1175.

NOTE Make sure to keep the password in a secure place, or remember it. The password should not be given out to people who are not authorized to perform upgrades.

The password is stored in memory in the tool and does not reside in the CPC Programming Card.

For more information on using the tool to perform an upgrade, see the Installation Note for the specific release of your monitor.

Create or Change the Password for the Tool

Once the password is changed, it cannot be changed back to the default password.

Step 1 Select the Password Entry softkey followed by the default password (1175) or the current password if the password has already been set. Read the security message and press Instrument Config or Monitor Setup .

Step 2 Select the Password Entry softkey again and enter the desired password. A password can be between five and nine digits.

Step 3 Re-enter the password to confirm it and then press Instrument Config or Monitor Setup to leave the password task window.

Edit the Monitor Serial Number (Philips Internal Only)

The Edit Serial No softkey is available if a new (empty) EEPROM has been added on that board. Unauthorized changes to the serial number could affect the product warranty.

Step 1 Select the Edit Serial No softkey, if available, to display he Edit Serial Number screen. Read the security message and press Instrument Config or Monitor Setup .

Step 2 Use the keyboard to type in the correct serial number.

Step 3 Press Confirm . The screen displays the message `Please check again to make sure serial number is correct.`

The settings are stored in the tool and not in the programming card.

Step 4 Verify that the serial number has been entered correctly and press Confirm. The screen displays the message `New serial number stored in EEPROM.`

Step 5 Press Instrument Config or Monitor Setup to return to the monitor setup task window.

Clone User Settings with the Tool

The CPC Programming Tool can be used to clone user settings onto new monitors of the same model and configuration (same EEPROM number). For example, if a customer has a 6-wave monitor, you can use the CPC Programming Tool to clone the user settings of that monitor onto another 6-wave monitor of the same model. To perform this procedure, you need a CPC Programming card that contains the EEPROM number of both monitors.

Step 1 Press EEPROM Cloning to display the EEPROM cloning window.

Step 2 Press Read Settings followed by Confirm to store the monitor's user settings on the CPC Programming Tool.

Step 3 The message `...Reading EEPROM` is displayed, followed by the message `...Settings stored in local memory` when the read process is complete.

Step 4 Go to the receiving monitor and attach the tool to the appropriate Flash port.

Step 5 Press EEPROM Cloning to display the EEPROM cloning window.

Step 6 Press Program Settings followed by Confirm to program the monitor with the configuration settings you stored on the CPC Programming Tool.

Step 7 The message `...EEPROM programming in progress` is displayed, followed by the message `... Programming done` when the cloning process is complete.

Step 8 Press Instrument Config or Monitor Setup to return to setup screen.

Perform Upgrades with the Tool

The CPC Programming Tool is also used to perform monitor upgrades.There are two different types of procedure that need to be performed to complete a successful upgrade: a Software Upgrade and an EEPROM Upgrade. (The Central Station has an additional upgrade called the Arrthymia upgrade.) The installation note included with the CPC Programming card will give detailed information on how to perform these procedures. The monitor will also prompt you with text messages as you perform the upgrade. In general you perform the Software upgrade and then the EEPROM upgrade. CCM finishes with the Arrthymia upgrade.

Troubleshooting the Tool through Tool LED Patterns

STATUS	PASS	Fail	Condition/Corrective Action
ON	OFF	OFF	Initial condition of product
ON	Blinking	OFF	Flash upgrade in progress
ON	ON	OFF	Flash upgrade completed
ON	ON	ON	Interconnection failure: no communication between CPC and host; 1. Check connection of programming tool to host product 2. Check that Programming Card is properly inserted in programming Tool 3. Suspect bad programming tool or cable 4. Suspect bad CPC Card
OFF	OFF	ON	Checksum Error: process has been interrupted during programming; Repeat upgrade procedure; if same error occurs: 1. Suspect CPC Card 2. Suspect Programming Card
ON	OFF	ON	Programming Error: hardware configuration is incorrect for the software you are programming; 1. Check Programming Card part number 2. Check that you are using the correct CPC port

Troubleshooting the Tool through Monitor Error Messages

Error Message Displayed	Possible Cause/Corrective Action
`SOFTWARE INCOMPLETE`	This message may be displayed in the alarm field at the top right of your screen after booting up. Possible causes include: • Interrupted Flash ROM programming • Corrupt data in the Flash ROM • Blank Flash ROM • Hardware failure on CPC Card
`...Memory card failure, upgrade not allowed`	Check that the Programming Card being used is correct. Check that the Programming Card has not been physically damaged.
`...Wrong Memory Card for this instrument`	Check that the Programming Card being used is correct. Check that the CPC is in the correct slot
`...Change of memory Card not allowed`	This message will be displayed if the Programming Card is exchanged within the programming tool during an operation.

Error Message Displayed	Possible Cause/Corrective Action
`...Tool disconnected, connect and try again`	Check that the tool has not disconnected from the service port during operation. Check the connections of the 20-wire ribbon cable to the tool and CPC port. Check the physical condition of the 20-wire ribbon cable. The signal continuity of the cable (Philips M2300-67210) may deteriorate with repeated use. Philips recommends that you replace this cable approximately every three months, or more frequently if the cable displays signs of deterioration.
`..Memory Card ejected, insert and try again`	This message will be displayed if the Programming Card is ejected from the programming tool during an operation.
`...Programming failed, please retry`	Retry the operation; if this condition is not corrected upon retrying 5 times, the message `...Software upgrade failed, upgrade not possible` will be displayed (see below).
`...Software upgrade failed, upgrade not possible`	Possible defective Flash ROM or CPC; CPC must be replaced.
`...Software incomplete, upgrade software first`	This message will be displayed during an EEPROM Upgrade operation if the Flash ROM software of the current CPC is incomplete. You must perform a Software Upgrade before the EEPROM Upgrade can be performed.
`...Software not upgraded, upgrade software first`	This message will be displayed during an EEPROM Upgrade operation if the current software release and the selected EEPROM part number do not match. You must perform a Software Upgrade before the EEPROM Upgrade can be performed.

Glossary

A

Alphanumeric Keys - These are single press keys used to input patient information and drug calculations into the monitor.

B

Backplane - The backplane of the Computer Module contains the connections for the front and rear function cards.

Blank Rack - The blank rack is used to cover the front of the Computer Module when a Satellite Rack is being used. It is the interface for Satellite Racks to the system and contains a rear connector that outputs information from the rack to the Computer Module.

C

Classic Control Panel - The hardkeys, softkeys and alarm indicators of the Classic human interface (Release D or earlier). Available with and without the SUSPEND key (See Chapter 6 “Parts List for CMS”).

Cold Start - During a cold start the CPU Cards run a detailed test of memory which erases the system database for patient data management. All active settings and patient data is lost.

Computer Module - The Computer Module contains the hardware and software for the processing functions of the monitor. Most of the external connections of the monitor are in the rear of the Computer Module.

CPC Flash Port - This port is located on the Configurable Processor Card (CPC) in slot 12 and is the connector for the CPC Programming Tool.

D

Double-width Module - The term double-width is used to designate that the module occupies two slots in the module rack.

E

Error Codes - Whenever one of the function cards is unable to perform an operation, an error code is generated. Error codes can be for fatal and non-fatal errors.

Extended Test - During the extended self-test the CPU Cards run a detailed memory test erases the system database for patient data management. All patient data is lost as the memory test is equivalent to a cold start.

F

Fatal Errors - Fatal errors are errors which cause the CMS to re-start.

Front Panel -The plastic bezel on the front of the monitor that contains controls and connectors, including the control panel and CRT adjustments.

G

Grounding Terminal - The Computer Module and Display Module of the CMS each have a ground terminal stud which allows connection to an equipotential grounding system.

H

Handheld Keypad - The Handheld Keypad is an input device used on the Main Display to interact with patient data management and drug calculator software.

Hardkeys - These are single press keys with labels used as selection controls. Typically, hardkeys access the Selection Window of its label.

HIF Connector - The Human Interface Connector is a Human Interface Link (HIL) connector used on a main display to attach the Handheld Keypad.

Hot Start - The Monitor makes a hot start when it has been powered down for a period less than one minute. The active user default values, including parameter

module settings are recovered and retained on restart.

Philips **Network** - The Serial Distribution Network of the CMS (also known as CareNet or SDN).

I

INOP - Inops are messages displayed on the screen when the CMS cannot measure or process signals properly. This could be due to patient-related or equipment-related problems.

Instrument Grounding - The detachable three-wire power cable grounds the instrument to the power line ground when plugged into an appropriate three-wire receptacle. This cable protects both the patient and the hospital staff.

Integral Plug-in Module Rack - The integral plug-in module rack fits in the front of the Computer Module and hold plug-in modules. It contains a rear connector that is used to output information from the rack to the Computer Module.

L

Line Voltage Selection - Switch-mode power supply automatically selects the necessary line voltage for the system. The fuse values corresponding to the switch-mode power supply are listed in Chapter 5 “Repairing the CMS”.

Local Bus - This is the local communication system. It is a buffered processor bus that allows access to local memory cards, SRAM and EPROM that contain software for the exclusive use of the master processor.

Local Clusters - The local bus is connected to all the connectors in the backplane but it is interrupted to form clusters that share a connection to the same local bus. There are 10 local clusters in the backplane with varying numbers of connectors.

Locking Cam - A Locking Cam is a plastic latch used to lock the Display Module or Computer Module into place.

M

Main Display Module - Main Displays are 14" CRT (Mono or Color) or 10.4" Flatscreen with integrated Control Panel for the human interface, or XGA display.

Main Screen - This screen shows the waveforms and numerical readouts of the parameters you have chosen to monitor, alarms, INOP messages, bed label, date and time, and arrhythmia messages (when assigned).

Membrane Keypad - The plastic bezel on the front of the Handheld Keypad that contains the controls and connectors, including the control panel and alphanumeric keypad.

Message Passing Bus - This is the global communication bus for the system, and is used for communications between CPU cards as well as to intelligent interface cards. This bus appears on all the connectors.

Mounting Plate - The Mounting Plate is a metal plate with slots used to attach a Display Module or Computer Module with feet to a flat surface.

N

Non-fatal Errors - Non-fatal errors are general errors that are not significant enough to affect normal CMS operation.

P

Parameter - The parameter of the plug-in module is the specific clinical measurement performed by the module. Some modules, like the ECG/Resp module, are capable of monitoring more that one parameter.

Plug-in Module Rack (Integral or Satellite) - The Plug-in Module Rack is the interface between the plug-in modules and the Computer Module. Module racks can be integrated in the Computer Module or remotely located in the patient vicinity.

Plug-in Modules - The plug-in modules are the interface between the patient cables and the Plug-in Module Rack. Each module is responsible for specific measurements. The number and type of modules used will depend on the monitoring situation.

R

Rear Panel - The panel on the rear of the display that contains the CRT controls and power, HIL and video connectors.

Remote Display Module - Remote displays are 14" Mono, 14" Color or 21" Color without Control Panels.

Remote Power Supply - The Remote Power Supply provides the power for the Flatscreen Display, Function Box and Frontend Modules.

S

Satellite Rack - An external rack, which is mounted separately from the **CMS**. It is used to provide expanded space for your plug-in modules.

Selection Window - The Selection Window is the first operating level where you can choose a specific activity or function. It is entered through a hardkey on the control panel or the remote keypad.

Self-Test - This Philips monitor has a module self-test which generates and displays test waveforms and corresponding numerics for all the modules that are connected through a rack and turned on.

Single-width Module - The term single-width module is used to designate that the module occupies only one slot in the module rack.

Softkeys - These are single-press keys used as selection controls to enter Task Windows and they correspond to the softkey labels displayed above them on the screen.

Spanning Rails - The spanning rails are metal rails that can be attached to the bottom of a Display Module or Computer Module to provide a mounting surface for an adapter plate. The spanning rails are attached to the module using the mounting feet holes.

Specification Tests - Specification tests are test which a hospital biomedical engineer can use to check the performance of parameter modules with general, special and manufactured test equipment.

Standard Control Panel - The hardkeys, softkeys and alarm indicators of the Standard human interface (Release E or later).

Start-Up Error Codes - Start-up error codes give similar information to the Status Log entries, except the codes are given are in hexadecimal notation.

Status Message - The status message is a string of text displayed in the top center of the screen below the date and time. A message is displayed in status line to indicate the current operating mode if not Monitoring.

T

Task Window - The task window is the second operating level which allows you to make changes or adjustments to the parameters and screen displays, or to perform procedures.

U

Utility Bus - This includes functions required by the whole system, for example, power and clock signal distribution. This bus appears on all the connectors.

V

Video Termination - The video termination switch on the Display Module is switched ON if only one display is used. If slave displays are used, the switch is turned OFF on all displays except the last display in the chain.

W

Wall Channel - The wall channel is a metal channel that attaches to a wall and allows mounting options to be adjusted vertically to the desired height.

Wall Hanger - The Wall Hanger is a metal bracket that is used to hang the Computer Module below a mounting arm.

Warm Start - During a warm start the System behaves as during a cold start, but an abbreviated version of the self-test is carried out. The system database for patient data management is checked and recovered. All active settings are lost.

X

X-Start - During an X-start, the system reacts as after a cold start, the only difference being that the user default settings of the Monitor are downloaded to the EEPROM of the modules. An X-start occurs after changing operating mode or configuration set

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